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A MONOGRAPH OF THE WORLD CERYLONIDAE
(COLEOPTERA; CUCUJOIDEA)

PART I – INTRODUCTION AND HIGHER CLASSIFICATION

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on his 85th birthday*

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I. INTRODUCTION

The purpose of this monograph of the Cerylonidae is to summarize our knowledge of the family and produce a firm taxonomic basis for subsequent studies. This paper summarizes 11 years of my work on Cerylonidae that began when I was a student at Warsaw Agricultural University. My initial interests in this group was stimulated by a paper by SEN GUPTA and CROWSON (1973) and wise advice of my friend and colleague Dr S. Mazur. After several years of mostly descriptive studies, I realized that the family is much richer in genera and species than I had thought, and that of my earlier papers were incomplete. Moreover, I also realized that many papers by other authors were inaccurate or incomplete. This monograph of the Cerylonidae is an attempt to correct these sediciencies. The monograph, for practical reasons is divided into two major parts; the first part includes an introduction and higher classification of the family, while the second part is a taxonomic monograph with keys to the world species, brief descriptions and illustrations, with a world catalogue at the end. The task would never have been completed without generous help from many colleagues and institutions, and all of them are sincerely acknowledged.

The spelling of the family name has recently been a subject of controversy. The group was originally named Cerylonides by BILLBERG (1820). ERICHSON (1845) appears to be the first to use Cerylini, and was followed by GANGLBAUER (1899), GROUVELLE (1908), EMDEN (1928) and HEINZE (1944a). Ceryloninae was widely adopted by French (Lacordaire, Jaquelin du Val), British (Sharp) and American (LeConte, Horn, Casey) authors. This family-group name was also adopted by HETSCHKO (1930) in the World Catalogue. This name is in a continous use by most of recent authors, including myself, but was recently questioned by KUSCHEL (1979), who returned to Cerylidae. The type genus *Cerylon* was supposed to be derived from the Greek combination of nouns, and because of its termination of nominative singular «-on», considered as being of neuter gender of the second declension. Therefore its stem for the forming family-group names is to be Ceryl - not *Cerylon* -. LATREILLE (1802) did not give derivation of his name, and it was variously interpreted by different authors. He himself probably did not pay attention to the name derivation. However in his latter papers (1804, 1807, 1810) he treated

his name as a masculine, since 10 species included in this genus all had endings of a masculine gender (picipes, depressus, attenuatus, nitidus, bipustulatus etc.). LATREILLE (1807) in the diagnosis of the genus *Cerylon* (p. 14) gave the following statement in Latin «in Cerylone terebrante e quo characteres deprompti» when referring to *C. terebrans*. From this it is clear that Latreille considered the stem to be *Cerylon-*. The Latreille's action may be summarized as follow: he erected the name *Cerylon* and gave its gender (masculine) and clearly considered it to be third Latin declension (*Cerylon*, *Cerylonis*), with the stem being *Cerylon-*. I think the original author should be given a credit for deciding how *Cerylon* was to be treated and so I argue in favour of retaining *Cerylon* Latreille as a masculine gender and Cerylonidae as the correct spelling of the family name.

A) HISTORICAL

The history of the family Cerulionidae as an independent taxon is short since until 1955 it was a subfamily or tribe of the family Colydiidae. The main facts of the history of the group and its most important taxa are summarized as follow:

- 1802 - LATREILLE erected the genus *Cerylon* in his family «Xylophagi» with the following diagnosis « * Genre. *Cérylon*; cerylon. Dixième article des antennes formant un bouton qui paroît recevoir le onzième. Tarses du genre précédent. Corps allongé. Corselet déprime. Exemple. *Lyctus terebrans*. F.» According to the Code (Article 67. (c)(1) such action does not constitute a designation of the type species.
- 1804 - LATREILLE redescribed the genus *Cerylon* and included 10 species in it, most of them now belong to various genera and families (Histeridae, Colydiidae, Bostrichidae; Rhizophagidae), and among them he included *Lyctus histeroides* Fabricius.
- 1807 - LATREILLE delimited the genus *Cerylon* to two species: *Lyctus histeroides* Fabricius and *Ips terebrans* Olivier, the latter is now classified in the colydiid genus *Pycnomerus* Erichson.
- 1810 - LATREILLE designated *Lyctus histeroides* Fabricius, 1792 as the type species of his genus *Cerylon*.
- 1820 - BILLBERG used Cerylonides, as a name for one of his natioes for *Cerylon* Latr., *Nemozoma* Latr and *Cis* Latr., and characterized them as having 10-segmented antennae.

- 1822 - LEACH described the genus *Murmidius* in the family Byrrhidae;
- 1843 - AUBÉ erected the genus *Philothermus* for the species *montandoni* found in the Royal Garden in Paris;
- 1845 - ERICHSON proposed the family Colydiidae and divided it into five groups: Synchitini, Colydiini, Bothriderini, Pycnomerini and Cerylini. In the group Cerylini he included five genera (*Cerylon*, *Philothermus*, *Myhocerus* and *Discoloma*), and he seemed to be the first author that observed the peculiar aciculate palpi in the group;
- 1854 - LACORDAIRE in his «Colydiens» included a tribe «Cerylonides» following Erichson's classification;
- 1857 - JAQUELIN DU VAL included within the family «Colydiides» the group «Cerylonites» and also erected the family «Murmidiides» for *Murmidius* Leach;
- 1861 - LECONTE classified *Murmidius* as a member of the family Histeridae;
- 1878 - HORN, in his synopsis of the USA Colydiidae, proposed a new classification of the family and included the tribe Cerylonini with two genera, *Cerylon* and *Philothermus*. He removed *Myhocerus* from Cerylonini to a separate family Murmidiidae. He first characterized cerylonids by their aciculate palpi and antennal insertion free, not concealed by the frontal extensions from above. He considered Murmidiidae was close to Cerylonini and the affinities with Histeridae superficial. He also separated *Discoloma* and its allies into a distinct family Discolomidae.
- 1883 - LECONTE and HORN included Murmidiidae as a subfamily of Colydiidae;
- 1888 - LEWIS treated both *Murmidius* and *Myhocerus* as aberrant histerids and included the subfamily Murmidiinae in Histeridae
- 1890 - CASEY described *Lapethus* and *Botrodus* placing them in the colydiid, tribe Murmidiini;
- 1885 - SHARP (1885a, b) described *Cautomus*, *Pachylon*, *Thyroderus* and *Ectomicrus* placing them in Cerylonini because of the aciculate palpi;

- 1894 - SHARP proposed a new classification of Colydiidae and divided it into 13 subfamilies including Ceryloninae and Lapethinae (new);
- 1895 - SHARP later in the same paper discussed Lapethinae (incl. *Lapethus* Casey and *Lytopeplus* Sharp) and *Murmidius* and *Mychocerus*. He concluded that *Lapethus* was definitively closest to Cerylonini but *Mychocerus* was not, and he, for the first time, used the Mychocerinae as a taxon including *Murmidius*;
- 1899 - GANGLBAUER divided Colydiidae into three subfamilies: Colydiinae, Cerylinae (incl. Deretaphrini, Bothriiderini, Anommardini, Cerylini) and Murmidiinae (incl. Lapethini, Mychocerini, Murmidiini). He recognized both Ceryloninae and Murmidiinae being distinct from true colydiids because of their exposed antennal insertions and Ceryloninae distinct from Murmidiinae because of the prothorax without antennal cavities;
- 1908 - GROUVELLE proposed dividing Colydiinae into 4 subfamilies (Colydiinae, Euxestinae, Cerylinae, Murmidinae); he first transferred *Euxestus* Wollaston and its allies from Erotylidae to Colydiidae (close to Ceryloninae) because of the exposed antennal insertions, although his observation on 3-segmented tarsi were incorrect;
- 1918 - GROUVELLE transferred *Mychocerus* back to Cerylonini;
- 1928 - EMDEN provided a new classification of Colydiidae dividing it into 5 subfamilies, among them Murmidiinae and Cerylinae. The Ceryloninae included 5 tribes - Deretaphrini, Bothriiderini, Anommardini, Euxestini and Cerylini. His observation about the constitution of Murmidiinae and Cerylinae were mostly correct, but the characters he used to separate these taxa (antennal grooves or cavities on prothorax present vs. absent) led him to obvious mistakes e.g. considering *Cycloxemus* Arrow, because of distinct antennal grooves, a member of Murmidiinae not Euxestinae. He provided keys to the species and catalogue to *Pseudodacne* Crotch and *Euxestus* Wollaston, and his paper was the first review of a group in the Cerylonidae;

- 1930 - HETSCHKO, in the World Catalogue of the Colydiidae, followed most of Emden's classification but included some of Ganglbauer's ideas as well. He recognized 4 subfamilies - Colydiinae, Ceryloninae, Murmidiinae and Euxestinae. The Ceryloninae included 6 tribes, among them Pachyochthesini and Cerylonini, while Murmidiinae included Murmidiini, Mychocerini and Lapethini. Probably following Emden he included *Eupsilobius* Casey, *Cycloxemus* Arrow and *Euxestoxemus* Arrow in Murmidiinae.
- 1932 - OKE described a new family Aculagnathidae for a peculiar myrmecophilous Australian beetle *Aculagnathus mirabilis* Oke.
- 1942 - HINTON (1942a) reviewed the tribe Cerylonini of Borneo and gave an interesting account of the classification of the group and provided a key to the genera of the World. He removed *Metacerylon* Grouvelle and *Tyrtaeus* Champion from Cerylonini to Botheriderini because of their non-aciculate palpi and synonymized Lapethini with Cerylonini. He also removed *Thyroderus* Sharp from Mychocerini (Hetschko 1930) to Cerylonini and rescripted the Murmidiinae to *Murmidius* and *Mychocerus* because of their distinctive palpi and prothoracic structures.
- 1944 - HEINZE (1944a), apparently unaware of the HINTON's paper (1942a), presented a new concept of the tribe Cerylonini and erected a new tribe, Metacerylini, for *Metacerylon* Grouvelle because of its non-aciculate palpi and abdominal ventrites with lateral expansions. This part of his study was superior to Hinton's although his work on Cerylonini was inferior to Hinton's. He returned to Ganglbauer's concept of Mychocerini (in Murmidiinae) and transferred *Axiocerylon* Grouvelle there from Cerylonini. He also presented a key to the genera of Cerylonini, having better ideas on the constitution of several genera (*Cerylon*, *Philothermus*, *Ectomicrus*, *Ploeosoma*) than those presented by Hinton.
- 1955 - CROWSON split the old family Colydiidae into two main groups. Cerylonidae was placed in Clavicornia while the remaining Colydiidae were placed in the Heteromera (Tenebrionoidea). He recognized subfamilies Euxestinae and Ceryloninae (incl. *Murmidius*);

- 1963 - DAJOZ erected a new family Dolosidae for a new genus and two new species from Africa with elongate mouthparts. He failed to establish the placement of the group putting in the «section Clavicornia of Cucujoidea, and more precisely near Colydiidae». This statement is surprising since Colydiidae (sensu CROWSON 1955), is the Heteromera. His observations about 6 abdominal spiracles, heteromeroid type of aedeagus and mandibular prostheca are misinterpretations;
- 1972 - BESUCHET presented an excellent revision of Aculagnathini, discussing the origin, function and construction of the piercing mouthparts in cerylonids of the *Cautomus*-complex. He synonymized Aculagnathidae and Dolosidae with Cerylonidae;
- 1973 - SEN GUPTA and CROWSON reviewed the classification of Cerylonidae, redescribed all the genera and gave a key to their identification. They recognized three subfamilies: Euxestinae (incl. Euxestini, Metacerylonini, Anommatini), Murmidiinae (incl. Murmidiini and Ostomopsini) and Ceryloninae (incl. Lapethini, Cerylonini, Aculagnathini). They added *Ostomopsis* Scott from Latridiidae, and removed *Eidoreus* Sharp (= *Eupsilobius* Casey) to Endomychidae. They presented a new basis for the classification of the family, including of the phylogeny of the family and its systematic position within Clavicornia. Larvae of *Cerylon*, *Philothermus*, *Murmidius*, *Hypodacne* and *Euxestus* were briefly described;
- 1975 - LAWRENCE and STEPHAN essentially followed Sen Gupta and Crowson's scheme in their review of the North American cerylonids. The changes were following: 1) Metaceryloninae, Ostomopsinae and Anommatinae were treated as independent subfamilies; 2) Lapethini and Aculagnathini were synonymized with Cerylonini and the piercing mouthparts considered as an independently derived character in different phyletic lines.
- 1976 - DAJOZ reviewed the Palaearctic Ceryloninae (1976a) and Euxestinae and Murmidiinae (1976b). Both papers did not include new ideas but contained many obvious errors and misinterpretations;
- 1980 - DAJOZ reviewed the Malagasy Cerylonidae and Colydiidae, but this treatment was incomplete, and many of his keys and

descriptions are inaccurate. He considered Metacerylonini as a tribe in Colydiidae-Bothriderinae and included there two genera *Metacerylon* and most *Ceryleuxestus*, while two species of *Ceryleuxestus* were included in *Cerylon* (*pressulum* Dajoz and *brevicollis* Fairmaire) in his Cerylonidae;

- 1984 - I revised the tribe Lapethini, with a new concept of the tribe based on the structure of the venter and described the larva of *Lapethus* Casey being close to *Philothermus* Aubé;
- 1985 - NIKITSKY reviewed Cerylonidae of the Soviet Far East following Sen Gupta and Crowson's higher classification; he provided keys to the East Palaearctic species including Japan;
- 1986 - PAL and LAWRENCE, in a discussion on the systematic position of Cerylonidae, Bothrideridae and related families, gave a key to subfamilies of both these families and a character-matrix of all related taxa. They transferred Anommatainae from Cerylonidae to Bothrideridae basing on larval and adult structures. They placed *Micruluma* Carter, described as a tenebrionid, within the Cerylonidae-Metacerylonini.
- 1988 - I (1988a) reviewed the Australian Cerylonidae and gave keys to their identification and described three new genera - *Hypodacnella*, *Lawrencella* and *Australiorylon*.

B) MATERIAL AND METHODS

This revision is based on approximately 17,000 adult specimens of more than 500 described and undescribed species, examined during the past ten years. Specimens representing all the genera and almost all the species (including all available types) were examined. For comparative purposes many species of related groups (Bothrideridae, Corylophidae, Discolomidae, Endomychidae, Lathridiidae, Alexiidae) and of groups more distantly related of Cucujoidea (Byturidae, Diphylidae) were examined in detail.

Larvae of all available genera of Cerylonidae and of closely and distantly families of Cucujoidea were examined.

Most of the cerylonid genera (except for *Lawrenciella*, *Ivius*, *Bradycycloxenus*, *Protoxestus*) were examined in detail using standard methods; in the subfamily Ceryloninae, especially in the *Cerylon-P-hilothermus* complex, nearly all the species were dissected and exa-

mined in glycerin. Specimens were cleared in boiling 10% solution of KOH and transferred to glycerin; after study they were stored in microvials or on permanent mounts in canada balsam. Line drawings of adult and larval structures from permanent slides or from glycerin-preserved specimens were made with a camera lucida attached to an Amplival-Zeiss microscope, while the adult outline drawing were done with a drawing tube on a Citoval-2 Zeiss compound microscope.

Below are the institutions and private collections that have loaned specimens used in this and the following part of the cerylonid monograph:

- Australian National Insect Collection, CSIRO, Canberra, Australia (J.F. Lawrence);
 Biosystematic Research Institute, Ottawa, Canada (A. Smentana);
 B. P. Bishop Museum, Honolulu, Hawaii, USA (S. A. Samuelson);
 British Museum (Natural History), London, England (R.J.W. Aldridge; L. Jessop; R.D. Pope);
 Bremer H.J., Düsseldorf, West Germany, private collection;
 California Academy of Sciences, San Francisco, USA (D. Kavanaugh);
 Deutsches Entomologisches Institut, Eberswalde, East Germany (L. Dieckmann);
 Entomological Museum, Lund University, Lund, Sweden (R. Danielsson);
 Field Museum of Natural History, Chicago, Illinois, USA (J. Ashe; A. Newton, Jr.);
 Forschungsinstitut Senckenberg, Frankfurt, West Germany (R. zur Strassen);
 Franz, H., Mödling, Austria, private collection;
 Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium (L. Baert; R. Damoiseau);
 Instytut Zoologii, PAN, Warszawa, Poland;
 Ivie M.A., Bozeman, Montana, USA, private collection;
 Musée Royal de l'Afrique Centrale, Tervuren, Belgium (J. Decelle);
 Museo Civico di Storia Naturale, «Giacomo Doria», Genova, Italy (R. Poggi);
 Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA (A. Newton, Jr; M. Thayer);
 Muséum d'Histoire Naturelle, Geneva, Switzerland (I. Löbl);
 Muséum National d'Histoire Naturelle, Paris, France (N. Berti);
 Museum für Naturkunde der Humboldt Universität, Berlin, East Germany (M. Uhlig);
 National Museum of Natural History, Prague, Czechoslovakia (J. Jelinek);
 National Museum of Victoria, Melbourne, Australia (A. Neboiss);
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 Naturhistorisches Museum Wien, Vienna, Austria (H. Schönmann);
 Pakaluk J., Lawrence, Kansas, USA, private collection;
 Rijksmuseum van Natuurlijke Histoire, Leiden, Netherlands (J. Krikken);
 Slipinski. S.A., private collection - now in Instytut Zoologii PAN, Warszawa, Poland;
 Slovenske Narodne Muzeum, Bratislava, Czechoslovakia (I. Okali);
 Snow Entomological Museum, University of Kansas, Lawrence, Kansas, USA (J. Pakaluk);
 Termesztudományi Museum, Budapest, Hungary (Z. Kaszab, O. Merkl);
 Universität Hamburg und Zoologisches Museum, Hamburg, West Germany (G. Abraham);
 Universitets Zoologiske Museum, Copenhagen, Danmark (O. Martin);
 University of Moscow Museum, Moscow, USSR (N. Nikitsky);
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The following abbreviations are used in the text below referring to the collections:

CAS - California Academy of Sciences;
CNC - Biosystematic Research Institute;
FMNH - Field Museum (Natural History);
IZPAN - Instytut Zoologii PAN;
MCZ - Museum of Comparative Zoology;
MHNG - Muséum d'Histoire Naturelle de Geneve;
MSNG - Museo Civico di Storia Naturale Genova.

Under particular genera, the BIOLOGY and DISTRIBUTION sections summarize all the data from the material examined, including information for underscribed species. The section SPECIES INCLUDED lists alphabetically all the valid species that have been examined of a particular genus; their references and synonymies will appear in the second part of this monograph. The section does not list new combinations that are listed separately in the Appendix A. The references are for the generic and specific names treated in this paper, including important revisions or larger papers on the taxonomy of Cerylonidae and other papers cited in the text. Because of a limited space all species references are not included; these will appear in the second part of the monograph.

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II. SYSTEMATIC POSITION OF THE CERYLONIDAE

A) INTRODUCTION

In the newly established system of Coleoptera (CROWSON 1955) the Cerylonidae were classified as an independent taxon within the superfamily Cucujoidea, section Clavicornia. The remaining taxa of the long established subfamily Ceryloninae (Colydiidae) were retained within the Colydiidae proper within the section Heteromera of the same superfamily. Both sections were treated as independent superfamilies by LAWRENCE and NEWTON (1982) and LAWRENCE (1982), namely Cucujoidea (=Clavicornia) and Tenebrionoidea (=Heteromera) and these names are used in this paper. The systematic position of Cerylonidae within Cucujoidea is well established having the tarsi 3-3-3 or 4-4-4 in both sexes (never heteromeroid), antennae with distinct club, trochanters elongate or weakly heteromeroid, abdominal ventrites freely articulated (never fused basally), aedeagus with tegmen more or less ring-like and surrounding the median lobe or, if reduced lying dorsal to the median lobe, abdominal segment VIII without functional spiracles, larva with well developed legs and pygopod, the mala falciform or obtuse apically, mandible sometimes (*Murmidius*) with hyaline prosthema and the tarsungulus unisetose.

CROWSON (1955, 1960) proposed the cerylonid-group within Cucujoidea to include families close to Cerylonidae that share the following characters: all tarsi 4-4-4 or 3-3-3 (never 5-5-5), wings without a closed radial cell and with reduced number of anal veins, or if more than one anal vein the first one runs into a divided subcubital fleck, retracted aedeagus resting on one side with either tegmen strongly reduced or the median lobe strongly curved and without median struts, larval tarsungulus unisetose, sensory appendage of antennal segment II usually as long as segment III, and spiracles almost always annular. He proposed to include within the group the following families: Alexiidae (Sphaerosomatidae), Endo-

mychidae, Coccinellidae, Corylophidae, Cerylonidae, Discolomidae, Merophysidae and Latridiidae. SEN GUPTA and CROWSON (1973) and LAWRENCE and STEPHAN (1975) discussed characters separating Cerylonidae from the remaining families of the cerylonid-group. Recently PAL and LAWRENCE (1986) formally transferred Bothrideridae as an independent taxon removed from Colydiidae (Tenebrionoidea) to Cucujoidea next to Cerylonidae. They presented a character-taxon matrix for all subfamilies of Cerylonidae, Bothrideridae and some related groups of Cucujoidea. They concluded the relationship among Cerylonidae and Bothrideridae are complex and no clear separation of the two groups is possible.

In the following section I discuss the similarities and major difference between the families of the cerylonid-group and Cerylonidae, and include a brief discussion of a possible relationship of Cerylonidae to these families. No attempt has been made to produce a cladogram summarizing the relationship of these families, mostly due to our limited knowledge of these groups. Moreover, several projects in progress by R.A. CROWSON, J. PAKALUK, T.K. PAL and myself on Cucujoidea in general, Corylophidae, Endomychidae and Bothrideridae will likely provide additional data for such a phylogenetic analysis. A cladistic analysis and phylogeny of the cerylonid-group is a long-term project by J. PAKALUK and S.A. SLIPINSKI and the results will be published elsewhere.

B) THE CERYLONID-GROUP OF THE CUCUJOIDEA

The family most closely related to Cerylonidae within the cerylonid-group (PAL and LAWRENCE 1986) seems to be Bothrideridae (including Bothriderinae, Teredinae, Xylariophilinae and Anommatainae) with particular similarities to the Euxestinae (*Metacerylon*) (DAJOZ 1977b; HEINZE 1943). It should be noted however that Bothrideridae and Cerylonidae in the present sense are likely paraphyletic taxa. Bothrideridae shares with Euxestinae a visible fronto-clypeal suture (also with Murmidiinae and Ostomopsinae), maxillary lacinia with an apical spine, hind wing with jugal lobe, abdomen with 7 pairs of spiracles, last ventrite smooth on hind edge, and larva with urogomphi. All of these characters are probably plesiomorphies and therefore of no particular significance for a classification. The Bothrideridae itself is a heterogenous group and

therefore difficult to be distinguished from Cerylonidae as discussed by PAL and LAWRENCE (1986). The relationships of these groups is complex and is in discussed in more detail under the phylogeny section (p. 40).

Sphaerosoma (Alexiidae) shares with Cerylonidae (mostly Euxestinae) a distinct fronto-clypeal suture (except for *Loebliorylon* and Ceryloninae), metendosternite with a short, broad stalk, ventrites with internal apodemes, aedeagus with long, weakly sclerotized median lobe and the dorsal tegmental lobe asymmetrical and lying above the median lobe (with Euxestinae only). Again, most of these characters are probably plesiomorphies, shared with other families of the cerylonid-group (Endomychidae, Bothrideridae). The securiform maxillary palpi and mesocoxal cavities eternally open distinguish adults of *Sphaerosoma* from any Cerylonidae. *Sphaerosoma* larvae differ from Cerylonidae in having 5 stemmata on each side, bicameral spiracles, short upturned urogomphi and tubercles on abdominal tergite VIII.

Corylophidae shares with Cerylonidae internal apodemes on ventrites II-IV, aedeagus without articulated paramers, median lobe without median struts, a short and broad stalk of the metendosternite, and larvae with no more than 2 stemmata on each side without urogomphi. Both group also have commom habitats on various kinds of fungi and molds. This groups is being revised now by J. Pakaluk, and its constitution and relationships with Cerylonidae will be published elsewhere. The adults of Corylophidae (PAKALUK 1985a, 1985b, 1987, PAULIAN 1950) differ from Cerylonidae having the antennae comparatively short and with loose 3 or 5-segmented club, the club segments always with eversible vesicles, corpotentorium usually absent, maxillary lacinia absent or markedly reduced, wing venation strongly reduced, 7 abdominal spiracles (as in Euxestinae) and almost always abdomen with 6 (instead of 5) ventrites. Larvae of Corylophidae differ from those of Ceryloninae and Murmidiinae (Euxestinae have distinct urogomphi) having usually 2 stemmata on each side, the median endocarina absent (in relation to *Murmidius*), the abdomen almost always (except for *Foadia* Pakaluk) with glandular openings on the least two segments (1,8; 1,7 or 1,6) and spiracles annuliform with complex openings.

Adult Latridiidae share with some Cerylonidae a distinct fronto-clypeal suture, corpotentorium with median process, procoxal cavities rounded and externally closed, mesocoxal cavities externally

closed, wings with subcubital fleck and a single anal vein, claws simple and tarsi 3-3-3 (sometimes 2-3-3 in males), abdominal ventrites II-V with internal apodemes and 7 functional abdominal spiracles, and tegmen strongly reduced without articulated parameres. Most of those characters are plesiomorphies or seem to be independently derived in both groups (like reduced wing venation, reduced tegmen or 3-segmented tarsi). Adults of Latridiidae are distinguished from Cerylonidae having the labrum laterally expanded, antennal club loose, maxillary lacinia vestigial or very small, labial palpi 2-segmented and tarsi always 3-segmented with tarsomere I sometimes lobed below. There is little similarity between their larvae. Perhaps some similarities could be noted between latridiids and Ceryloninae and Murmidiinae because of the urogomphi absent, spiracles annular and vestiture consisting of scale-like setae. However, the latridiid larvae have 2-6 stemmata on each side, no median endocarina, mandible with asperate mola and apical part entirely on partly membranous, labial palpi 1-segmented and hypostomal rods well developed and divergent.

Discolomidae (JOHN 1954, EMDEN 1932, FUKUDA 1969, SCHAWALLER 1987) with their 3-segmented tarsi and broad disc-like larvae are of particular interest because of possible affinities to Murmidiinae (larva) and Ostomopsinae (adults). As discussed by PAL and LAWRENCE (1986) the larval similarities (disk-like form, hyaline protheca, long antennae) are probably convergences due to similar habitats (also shared by some coccinellids, e.g., *Platynaspis*) or are shared with other families as well. The larvae of Discolomidae (EMDEN 1932, 1938, 1957; FUKUDA 1969) differ from all known cerylonids by their 2-segmented antennae with the sensory appendage situated apically on antennomere II, hypostomal rods and median endocarina absent, and granular openings on at least abdominal tergite IV. Adults of both these groups share the following characters (sometimes only by some groups): fronto-clypeal suture present, procoxal cavities externally closed, mesocoxal cavities externally closed, meso-metasternal junction simple, wing with strongly reduced venation, abdomen with 5 functional spiracles, tegmen strongly reduced and without articulated parameres or ventral strut. Discolomid adults always have glandular openings on the pronotal sides, sometimes also on the elytra, the visible parts of metacoxae very small and almost circular, their cavities broadly closed externally by meeting of

metasternum and ventrite I, corpotentorium absent or without median process and ovipositor strongly reduced.

Merophysinae (Endomychidae) form a uniform group with clear relations to Endomychidae proper, but its systematic position is unresolved and is discussed separately here. Adult merophysines share with at least some Cerylonidae a visible fronto-clypeal suture (Euxestinae, Murmidiinae, Ostomopsinae), mesocoxal cavities closed laterally, wings without anal veins but with a subcubital fleck, metendosternite with a short and broad stalk with the anterior tendons moderately to widely separated, tarsi, 3-3-3, abdomen with 5 visible sternites and 5 functional spiracles, tegmen reduced and without articulated parameres or ventral strut, ovipositor without distinct styli or spiculum gastrale (similar to Murmiidinae). Because of the five functional spiracles this group could be related to Ceryloninae, Ostomopsinae, Loebliorylinae and Murmidiinae, and because of its fronto-clypeal suture to Murmidiinae and Ostomopsinae. Adults of these two cerylonid subfamilies differ from Merophysinae having their antennal insertions free (not concealed by the frontal extensions), posterior margin of the last ventrite crenulate and corpotentorium with a median process. The supposed larva of *Holoparamesus* collected by R.A. Crowson in Australia with adults, has a distinct lyriiform frontal suture, protheca reduced to a small tooth, cardo not transverse, maxillary articulating area reduced, labial palpi 2-segmented, spiracles annuliform, stemmata and urogomphi absent, tergites without setiferous tubercles, and vestiture of simple setae. Most of these characters (except for the cardo and spiracles) will distinguish it from *Murmidius* and other Cerylonidae.

Endomychidae (SASAJI 1978, STROECKER 1953, PAKALUK 1986, PAKALUK and SLIPINSKI in preparation) (excluding Merophysinae but including Mychotheninae and Eupsilobiinae) shares with at least some adult cerylonids a fronto-clypeal suture, mesocoxal cavities externally closed (Mychotheninae), wings with 1-3 anal veins and a subcubital fleck, metendosternite often with broad, short stalk and widely separated anterior tendons, tarsi often 3-3-3, abdomen with 5 ventrites often bearing internal apodemen, and 5 functional spiracles, tegmen reduced, without articulated parameres or tegminal strut, and ovipositor with reduced styli. The differences between Cerylonidae and Endomychidae include in the latter, the posterior margin of the last ventrite smooth (not crenulate), mesocoxal cavities usually open

externally, procoxal cavities internally closed, second tarsomere usually lobed below and procoxae oval or weakly transverse. The larvae of Endomychidae often have 4 stemmata on each side, frontal sutures distinct, hypostomal rods present and divergent, mandibular prostheca distinct, median andocarina absent and terga often with tubercles and modified setae. Most endomychids probably feed on fungi or slime-molds as in Cerylonidae, although they are some records predation (scale-incests) (SASAJI 1978).

Coccinellidae (GORDON 1977, KAMIYA 1965, SASAJI 1968a, 1968b, 1971a, 1971b) seem to represent a fairly advanced evolutionary line in the cerylonid-group with closest relationship to Endomychidae, and it seems to be possible that the former group originated from endomychid-like ancestors (R.A. CROWSON, personal communication). A peculiar structure of aedeagus in Coccinellidae could be derived from Eupsilobiinae (Endomychidae). The higher classification of coccinellids badly needs revision based on larval and adult material using phylogenetic methods. So far both classifications, that based on larvae and that based on adults show marked incongruences that needs to be resolved. Coccinellids differ from Cerylonidae having a fronto-clypeal suture absent, markedly expanded apically or securiform apical palpomeres, tormae of labrum extremely reduced, corpotentorium absent, procoxal cavities internally closed, metasternum always with complete femoral lines, second tarsomere usually dilated and lobed below, claws usually toothed and characteristic aedeagus with double tegmen bearing an articulated ventral strut. Coccinellid larvae can almost always be distinguished from cerylonids by having a toothed tarsungulus and tibiae with spatulate adhesive setae apically, frontal sutures usually lyriform (except for Epilachninae) and with distinct coronal suture, 3 stemmata on each side, mandible without mola or prostheca, maxillary articulating area and cardo absent.

Within the cerylonid-group there are families (or subfamilies) having 5 or 7 functional spiracles, but only the Cerylonidae (Euxestinae vs. remaining subfamilies) do both these conditions occur within a currently recognized family. Five functional spiracles are present in most of Cerylonidae, Endomychidae, Discolomidae and Coccinellidae. As will be discussed later on (p. 41) the Cerylonidae as delimited by SEN GUPTA and CROWSON (1973) and then by PAL and LAWRENCE (1986) form a paraphyletic group since the characters used to unite its members are either plesiomorphies (the median corpo-

tentorial process) or synapomorphies shared with other families of the group. In my opinion the Euxestinae should be excluded from Cerylonidae and either from a separate family or be included within Bothrideridae or Alexiidae. Such action needs much more investigations of the whole cerylonid-group. Therefore, the traditional family concept is retained here for taxonomic purposes, but for the phylogenetic discussion that follows Cerylonidae will be limited to the subfamilies with five functional abdominal spiracles (Ceryloninae, Murmidinae, Ostomopsinae and Loebliorylinae).

Discolomidae are characterized by at least five synapomorphies and seem to form a monophyletic group. The synapomorphies are: adults with hind coxae largely hidden and closed externally by the broad meeting of the metasternum and abdominal ventrite I, at least pronotal sides with glandular openings, and larvae with the antennomere III absent and the sensorium situated apically on the antennomere II. The Cerylonidae (except for Loebliorylinae) share a single apomorphy, i.e., the crenulate edge of the last abdominal ventrite. It is not clear whether this character originated in the ancestor to all the subfamilies. The structure of the crenulations examined under high magnification (fig. 18E, F) shows in Murmidinae and Ostomopsinae a specialized structure not seen in Ceryloninae. In addition, the apically widened elytral flange and different type of aedeagus with median lobe bearing dorsal struts in *Ostomopsis* is not seen in other subfamilies. Endomychidae (as delimited by LAWRENCE 1982) form a heterogenous group that could not be, so far, characterized by a single synapomorphy. Merophysines and mychothenises, as opposed to the remaining groups, have the mesocoxal cavities externally closed, larvae with simple setae and no stemmata. The externally open mesocoxal cavities (shared also by Coccinellidae, *Sphaerosoma* and a few Corylophidae) are postulated to represent a derived state caused by the unusual separation of the mesocoxae (R.A. CROWSON, personal communication). In Corylophidae this character is probably caused by the extreme reduction of the body size (J. PAKALUK, personal communication). This implies that the open mesocoxal cavities found in *Xylariophilus* (Bothrideridae) are not homologous with the secondarily open cavities in Coccinellidae, *Sphaerosoma* and Endomychidae. Considering the families with the five functional spiracles, Cerylonidae seems to be close to Mychotheninae (Endomychidae) via *Loebliorylon* and *Ostomopsi*, and to

Discolomidae via Murimidiinae; the coccinellids, as mentioned above, form a derived group probably arising from endomychids. I will briefly discuss these two possible relationships but without changing the present classification until more data are collected.

Loebliorylon is considered a cerylonid because of the following characters: maxillary and labial palps aciculate, corpotentorium with a median process, fronto-clypeal suture absent, mesocoxal cavities externally closed, abdomen with 5 pairs of functional spiracles and 5 ventrites, ovipositor with well developed styli and spiculum gastrale. The hind margin of the last ventrite is smooth, not crenulate and the symmetrical tegmen bearing a strut excludes this genus from Ceryloninae; I place it in a new subfamily Loebliorylinae. *Loebliorylon* shares with Mychotheninae mesocoxal cavities externally closed, abdomen with 5 pairs of spiracles, the antennal club relatively loose and 3-segmented and tegmen bearing a long strut. In all Mychotheninae examined the fronto-clypeal suture is visible, palpi are subulate, ovipositor is markedly reduced with weakly developed styli and the spiculum gastrale is absent. The characters shared with Mychotheninae are probably plesiomorphies, while the absence of the fronto-clypeal suture and aciculate palpi are probably synapomorphies with Cerylonidae proper. The question is, are these characters of common origin? The aedeagal type represented by *Loebliorylon* is more primitive than in Murmidiinae and Ceryloninae, and it seems unlikely to be derived from a *Murmidius* or *Botrodes*-type with a short ventral, unarticulated lobe. If this hypothesis is correct, then *Loebliorylon* is a sister group of Murmidiinae and Ceryloninae (perhaps also of Ostromopsinae), and both characters (fronto-clypeal suture absent, and aciculate palpi) are derived independently from those in Ceryloninae. The discovery of its larva may refute the above hypothesis.

Discolomidae generally shares with Cerylonidae (Murmidiinae) the following derived characters: mesocoxal cavities eternally closed, abdomen with 5 functional spiracles, wing without jugal lobe and only one anal vein, tegmen strongly reduced and usually without articulated parameres, ovipositor without distinct styli, spiculum gastrale absent, and the larva without urogomphi and more or less onisciform. Synapomorphies for discolomids (glandular openings, closed metacoxal cavities and 2-segmented larval antennae) could have been derived from Murmidiinae-like ancestors, retaining the disc-like type of larva with broad-based hyaline prostheca, asperate mola, elongate

antennae and 3 stemmata. In this case the median endocarina, lack of stemmata and hypostomal rods in larval murmidiines would have to be interpreted as synapomorphies.

C) KEY TO FAMILIES AND SOME SUBFAMILIES OF THE CERYLONID-GROUP

ADULTS

1. Trochanter distinctly heteromeroid, reduced, concealed within notch at base of femur; protibia widened apically with spurs of unequal lengths; elytra almost always with longitudinal ridges or carinae (Bothriderinae) BOTHRIDERIDAE
- Trochanter not reduced, visible; protibia rarely expanded apically with apical spurs subequal in length; elytra rarely with ridges or carinae 2
2. Mesocoxal cavities laterally open 3
- Mesocoxal cavities laterally closed 7
3. Antenna with club segments bearing hyaline vesicles; maxillary lacinia absent or vestigial (part) CORYLOPHIDAE
- Club segments without hyaline vesicles; maxillary lacinia well-developed 4
4. Fronto-clypeal suture absent; labral tormae greatly reduced; mandible without asperate mola; ventrites I-II usually connate; claws often toothed or appendiculate; aedeagus characteristic with double tegmen and articulated strut. COCCINELLIDAE
- Fronto-clypeal suture present; labral tormae well-developed; mandible with asperate mola; ventrites I-II freely articulated; claws simple; aedeagus with simple, often reduced tegmen 5
5. Functional spiracles on abdominal segments 1-7; procoxal cavities internally open 6
- Functional spiracles on abdominal segments 1-5; procoxal cavities internally closed ENDOMYCHIDAE
6. Antenna 11-segmented with compact, 2-segmented club; maxillary palp fusiform; wings present; corpotentorium with

- median process; tegmen with ventral articulated strut; tarsi with segments simple; body elongate-oval (Xylariophilinae) BOTHRIDERIDAE
- Antenna 10-segmented with loose 3-segmented club; maxillary palp securiform; wings absent; corpotentorium without median process; aedeagus with dorsal, nonarticulated lobe lying above the median lobe; tarsi with segment I usually lobed below; body broadly-oval (Sphaerosoma) ALEXIIDAE
7. Hind margin of last abdominal ventrite crenulate; abdomen with 5 functional spiracles (Ostomopsinae, Murmidiinae, Ceryloninae) CERYLONIDAE
- Hind margin of last abdominal ventrite smooth, never crenulate; abdomen with 5 or 7 spiracles 8
8. Metacoxae externally very small and almost circular, metasternum broadly meeting first abdominal ventrite laterally; glandular openings at least on prothorax; tarsi 3-segmented; antenna with 1-segmented club DISCOLOMIDAE
- Metacoxae externally larger and distinctly transverse, metasternum never meeting the first ventrite laterally; prothorax and elytra without glandular openings; tarsi and antenna variable 9
9. Antennal insertions hidden under sides of frons; tarsi 3-segmented; usually wingless; abdomen with 5 pairs of functional spiracles (Merophysinae) ENDOMYCHIDAE
- Antennal insertions always exposed; no other characters in combination 10
10. Labrum laterally expanded beyond front angles of clypeus; lacinia vestigial; abdomen with 7 pairs of functional spiracles; elytral punctures usually in regular rows; procoxal cavities firmly closed externally LATRIDIIDAE
- Labrum never expanded beyond angles of clypeus; no other characters in combination 11
11. Fronto-clypeal suture absent; antennal club segments with eversible vesicles; maxillary galea broad and lacinia vestigial or very short; abdomen usually with 6 ventrites; procoxal cavities closed externally; abdomen with 7 pairs of functional

- spiracles; elytra with punctures not arranged in rows; head usually small and hidden under prothorax CORYLOPHIDAE
- Frontal-clypeal suture present; antennal club segments without vesicles; maxillary lacinia fully developed; no other characters in combination 12
 - 12. Procoxal cavities internally closed, externally open; abdomen with 5 pairs of functional spiracles; tarsomere II usually lobed below; pronotum usually with paramarginal or basal sulci; metasternum often with postcoxal pits, rarely with femoral lines (part) ENDOMYCHIDAE
 - Procoxal cavities internally open, or if closed the cavities firmly closed externally as well; abdomen always with 7 pairs of functional spiracles; tarsomeres simple or I lobed below; pronotum without basal or paramarginal sulci; metasternum without pits, rarely with femoral lines 13
 - 13. Tarsi 3-segmented; eyes and hindwings absent; metasternum shorter than ventrite I (Anommatae) BOTHRIDERIDAE
 - Tarsi 4-segmented; eyes and hindwings present; metasternum as long or longer than ventrite I 14
 - 14. Prosternal process almost always parallel-sided and much narrower than coxa; procoxal cavities almost always externally open; corpotentorium without median process; hindwing always with divided subcubital fleck; intercoxal process of ventrite I usually subacute or narrowly rounded; aedeagus symmetrical with an anterior tegminal strut lying below the median lobe which has anterior struts (Teredinae) BOTHRIDERIDAE
 - Prosternal process always markedly expanded apically and almost always at least as wide as coxa; procoxal cavities externally closed, internally narrowly open; corpotentorium with median process; hindwing with or without subcubital fleck; intercoxal process of ventrite I more or less broadly rounded or almost truncate; aedeagus asymmetrical with anterior tegminal lobe lying above the median lobe that lacks anterior struts (Euxestinae) CERYLONIDAE

L A R V A E

1. Larva of triungulin type with entire dorsum sclerotized and pigmented; dorsal vestiture of strong posteriorly directed spines. (first instar) (ROBERTS 1980)
..... (Bothriderinae) BOTHRIDERIDAE
- Larva not of triungulin type, never with dorsal vestiture of posteriorly projecting spines 2
2. Larva ectoparasitic, very lightly sclerotized and grub-like (fig. 6E); vestiture of simple setae only; mandible without mola; maxillary articulating area obsolete; legs sometimes absent. (later instars) (Bothriderinae) BOTHRIDERIDAE
- Larva not ectoparasitic, usually at least head capsule pigmented; stemmata usually present; legs always present; dorsal surfaces granulate or tuberculate, often with lateral tergal processes; vestiture often consists of modified setae (expanded, clubbed, frayed) 3
3. Mandibles and maxillae stylet-like, either endognathous or enclosed within tubular, piercing beak; urogomphi absent (Ceryloninae) CERYLONIDAE
- Mandibles of normal chewing type, usually with basal asperate mola; urogomphi present or absent 4
4. Mandible without asperate mola and prostheca, often with tooth or process near base on inner side; tibiae almost always with spatulate adhesive setae apically; tarsungulus usually wide at base and then abruptly narrowing apically; maxillary articulating area obsolete; frontal suture visible and usually lyriform; 3 stemmata; legs usually long; terga usually pigmented and with tubercles; urogomphi absent ... COCCINELLIDAE
- Mandible (fig. 20E) with basal, asperate mola; tibiae never with adhesive setae apically; tarsungulus usually gradually narrowing apically; no other characters in combination 5
5. Urogomphi short, complex or acute and upturned (fig. 20C) 6
Urogomphi absent or long and divergent, never upturned and acute 8
6. Stemmata absent; lateral edges of terga 6-9 more strongly produced posteriorly than those of anterior terga; spiracles annular and not placed at the ends of tubes
..... (Anommatinae) BOTHRIDERIDAE

- Stemmata always present, 5-6 in number; lateral edges of all terga equally projected; spiracles annular-biforous and placed at the ends of tubes 7
- 7. Number of stemmata 5; urogomphi simple (Spaerosoma) ALEXIIDAE
- Number of stemmata 6; urogomphi simple or complex (Xylariophilinae, Teredinae) BOTHRIDERIDAE
- 8. Urogomphi long and divergent; terga often with lateral processes; stemmata 0, 2; spiracles placed at the ends of short processes, annular-biforous or annular (Euxestinae) CERYLONIDAE
- Urogomphi absent or inconspicuous; terga without processes; spiracles not situated on tubular processes 9
- 9. Antenna long, 2-segmented; sensory appendage situated apically on antennomere II DISCOLOMIDAE
- Antenna shorter and always 3-segmented; sensory appendage situated laterally on antennomere II 10
- 10. Mandible with apical part and prostheca obsolete; stemmata absent; vestiture of simple, pointed setae (Mychotheninae) ENDOMYCHIDAE
- Mandible complete; prostheca present or absent; stemmata variable; vestiture usually with at least some setae modified 11
- 11. Maxillary articulating area obsolete 12
- Maxillary articulating area present (fig. 20D) 13
- 12. Number of stemmata usually 2; abdomen almost always (except for *Foadia* Pakaluk) with glandular openings on segments 1 through 7 or 1 and 8; form usually more or less onisciform; tarsungular seta long and often spatulate; labial palpi usually 2-segmented; mandible entirely sclerotized CORYLOPHIDAE
- Number of stemmata usually 4-5; abdomen never with glandular openings; form usually narrow and not onisciform; tarsungular seta short, simple; labial palpi 1-segmented; mandible often with apical part membranous LATRIDIIDAE
- 13. Body strongly onisciform, disc-shaped; head with median endocarina (Murmidiinae) CERYLONIDAE
- Body not disc-shaped; andocarina absent 14

14. Stemmata absent; mala with acute apical spine; labial palpi apparently 1-segmented (Merophysinae) ENDOMYCHIDAE
 – Stemmata 2 or 4; mala without apical spine; labial palpi 2-segmented (major part) ENDOMYCHIDAE

III. FAMILY CERYLONIDAE

A) ADULT CHARACTERISTICS

Body oval, oblong to elongate and almost cylindrical; 0.8 to 5.0mm long; dorsum usually glabrous but sometimes distinctly pubescent. Vestiture of short and fine hairs, in some species of *Euxestoxenus*, *Thyroderus*, *Axiocerylon* it is of long or short squamiferous setae (fig. 11E). Dorsum brown or black, rarely bicoloured and in one undescribed species of *Pseudocerylon* tricoloured (yellow, brown and black).

Head (fig. 11D, 12A-F, 17F) globular without distinct postocular constriction («neck»), inclined and at least partly concealed by pronotum; in globular forms of Ceryloninae (*Rostrorylon*, *Mychocerus*, *Glomerylon*, *Lapethinus* etc.) all Murmidiinae head deeply retracted into prothorax, usually with transverse occipital ridge on vertex (fig. 109A); without stridulatory file on occiput. Eyes variable, large and finely faceted (*Murmidius* and *Mychocerinus*) to moderately large (many genera of Ceryloninae) or sometimes extremely reduced to 1-5 coarse, unipigmented facets (some *Philothermus*, *Mychocerus*) or completely absent in two species of *Philothermus* and one species of *Ostomopsis*. Antennal insertions exposed, not concealed from above by frontal extensions. Euxestinae and some species of *Philothermopsis*, *Mychocerus*, *Mychocerinus*, etc. have antennal groove by the lower margin of eye (fig. 64A), in the remaining genera the groove is very shallow or inconspicuous, but almost always traceable. Clypeus rounded anteriorly; fronto-clypeal suture present in Murmidiinae, Ostomopsinae and Euxestinae, absent in Ceryloninae and Loebliorylinae (fig. 2A, 74A, 92C); gular sutures indistinct or barely traceable near base, always widely separated. Tentorium well developed, with distinct tentorial bridge (corpotentorium) bearing median (rarely divided) process (fig. 2B, 4A, 113D); bridge is situated more posteriorly and more complicated in Murmidiinae and Ostomopsinae, while it is more anterior and simpler in Ceryloninae, Loebliorylinae

and Euxestinae (fig. 64A, 74A); anterior arms (pretentorina) and posterior arms (posttentorina) usually well developed and widely separated anteriorly, in *Ostomopsis* arms almost meeting anteriorly (fig. 8A). Antenna 6-11-segmented with antennal club of 1-3 segments, rarely indistinct and composed of gradually wider antennomeres (*Glyptolopus*); scape with dorsal surface sculptured like head, widened apically and with apical angles distinct, insertion of the pedicel always ventral and usually not visible from above; the pedicel always asymmetrical (fig. 77D); antennomeres sparsely setose; each club segment bears a few simple sensillae apically, in *Cautomus* apical segment with 2-3 sensory appendages, in *Ostomopsis* specialized, digitiform sensillae in lateral excavation (fig. 17C). Mouthparts variable, usually of the normal chewing-type with mandibular mola well developed, rarely of piercing-type with all components strongly elongate and mandible with poorly developed or obsolete mola (fig. 2,3). Mouthparts uniform in all subfamilies except Ceryloninae which are extremely variable, often within a single genus; generally species with normal mouthparts have the head less ophistognathous than species with piercing mouthparts that cause the head to be more ventral, and in the resting position partially or completely (*Rostro-rylon*) covered from below by the prominent anterior position of the prosternum (chin-piece). Labrum free and partially exposed; in Euxestinae, Murmidiinae and Ostomopsinae transverse (fig. 79F, 81E), with mesal arms of tormae oblique and not fused to outer arms, while the labrum is subquadrate to very elongate in Loebliorylinae and Ceryloninae (fig. 3A, 75B, 85C) with the mesal arms of tormae fused and the outer arms perpendicular or projected mesally; labral rods usually visible, long and slender (Ceryloninae) or shorter and clubbed (Murmidiinae, Ostomopsinae, Euxestinae and Loebliorylinae). Mandibles always with basal mola, (that might be strongly reduced) fringed prostheca and without dorsal cavities; mandible tridentate apically in all subfamilies except for Loebliorylinae and Ceryloninae; in Loebliorylinae mandible is distinctly bidentate, while in Ceryloninae bidentate or drawn into a piercing blade (fig. 3C-E). Maxilla with 2-segmented brush-like galea and slender lacinia bearing (fig. 65E) (Euxestinae) or not bearing apical spines; maxillary palpi (fig. 2A, 3F, G, 75A) aciculate in Loebliorylinae and Ceryloninae; subulate in Ostomopsinae, Murmidiinae and Euxestinae, last palpomere often with 2-5 peg sensilla at base (fig. 68C, 69E, 81F). Labium (fig. 3H,

I, 65F, 75F, 81A) with mentum trapezoidal, rarely markedly elongate with raised triangular region; prementum with pattern of long setae in Ceryloninae and Loebliorylinae, multisetose in Murmidiinae, Ostomopsinae and Euxestinae; ligula bilobed in Murmidiinae, reduced in Euxestinae and Ostomopsinae, well developed and often expanded laterally in Ceryloninae and Loebliorylinae; labial palpi 2-segmented with apical palpomere markedly narrowing apically and much narrower than the preceding palpomere in Ceryloninae and Loebliorylinae, slightly narrower than the preceding segment but not acuminate apically in Murmidiinae, Ostomopsinae and Euxestinae.

Prothorax (fig. 13-15, 16A-C) subquadrate to transverse, never elongate; margins usually bordered, rarely unbordered and/or crenulate (*Cautomus*, *Ectomicrus*); sometimes (*Axiocerylon*, *Suakokoia*, *Thyroderus*) lateral parts of prothorax with deep pits or translucent irregular cavities (fig. 11C, 14E). Procoxae externally rounded, usually widely separated by at least $0.5 \times$ their width, with hidden trochantin appressed to coxal crowling, and well developed, internal lateral extensions reaching usually darker pits on pronotal disk; procoxal cavities internally open or almost closed (Euxestinae), open or closed externally. Prosternal process (sternal projection) variable, usually $0.5\text{-}1.0 \times$ as wide as coxal diameter and weakly expanded apically; in Euxestinae and Murmidiinae process is usually much wider and markedly expanded apically; in some genera of Ceryloninae (*Orienterylon*, *Spinocerylon*, *Pachylon*, *Australiorylon*) the process is more or less parallel-sided for basal $3/4$ and then abruptly widened, but the cavities are closed posteriorly by notal projections (postcoxal processes) forming a complete posterior collar; in the genera with procoxal cavities posteriorly open (Murmidiinae, Ostomopsinae, *Mychocerus*, *Axiocerylon*, *Pseudolapethus*) the mesosternum is often elevated and the coxae are partly housed by the mesosternal concavities. In *Clavicerylon* and *Gyreleon* there is a mesosternal process fitting into an emargination of the prosternal process apically (fig. 13A). Prosternum often prominent antero-medially into a plate covering gular region of head from beneath (chin-piece) (fig. 13B, D, E, 14D); antennal groove to receive antennal funicle, if present, situated laterally along the sternopleural suture (fig. 13C-F) and often extended into and large cavities (pockets) to receive club, the cavity can be situated on the front of prosternum (fig. 14A), along the sternopleural suture as an extension of the groove (fig. 13C) or on the prothoracic

hypomera (fig. 15B); in Murmidiinae, some Ceryloninae (*Neolapethus*) and some Euxestinae (*Hypodacnella*) the antennal cavities are situated near anterior angles and partly covered underneath by the prosternal plate (fig. 14F, 77B, 108A).

Pterothorax (fig. 4C, D). Mesosternum variable, often with median carina or, rarely, a process fitting into an emarginate prosternal process (*Ellipsorylon*, *Clavicerylon*, *Gyreleon*, and in some *Pseudocerylon*); mesocoxal cavities closed outwardly by sterna; mesocoxae subcontiguos in subcylindrical forms like *Metacerylon* or *Metaxestus* but widely separated in oblong or flattened forms like most Euxestinae, Murmidiinae, Ostomopsinae and part of Ceryloninae; meso-metasternal junction straight-line type, never with distinct metasternal knob. Metasternum with medial line absent or reduced, visible at base, except for *Murmidius* and *Mychocerinus* where is complete (fig. 77F, 78D); femoral lines often present. Metendosternite with stalk short and broad, rarely absent, anterior tendons usually widely separated (fig. 29C, 80E), in Euxestinae (fig. 29D) laminae are located out on lateral arms well separated from anterior tendons which are more or less approximate.

Elytra completely covering abdomen, very rarely (in some wingless *Philothermus*, *Cautomus* and *Loebliorylon*) fused along suture; punctures usually distinct and arranged in 8-10 regular rows, rarely (*Cautomus*) irregular; scutellary striole absent and elytral flanges not widened apically except for *Ostomopsis* (fig. 16F); epipleura indistinct in Loebliorylinae, usually incomplete and in some genera of Ceryloninae (*Axiocerylon*, *Pseudolapethus*) abruptly narrowing at level of metacoxae and dentate; elytral intervals rarely convex or carinate (in Loebliorylinae and some genera of Ceryloninae), in the last subfamily *Ivies* presents an interesting parallelism to the complex elytral costae in some Bothrideridae (fig. 54).

Wing (fig. 5A, 6A-D) with jugal lobe present in Euxestinae; divided subcubital fleck present in Murmidiinae and most Euxestinae, absent in Ceryloninae, part of Euxestinae (*Metacerylon*, *Globoeuxestus*) Ostomopsinae, absent in Loebliorylinae. Anal veins 1-4, in some Euxestinae (*Hypodacnella*, *Protoxestus*), form anal cell (fig. 63E); radial cell always absent. Wing membrane folding in Ostomopsinae, Murmidiinae and Ceryloninae similar - with area *H* (FORBES 1926: fig. 142, 143) subdivided into two folds (concave and convex), area *A* and *B* absent; membranous part of wing relatively large transversely

folded at the middle without minor folds; Euxestinae with additional jugal fold and membranous part with 1-2 additional minor folds and *H* area not divided.

Legs relatively short (fig. 4E-G), in some forms, (*Cycloxenus*, part of *Euxestoxenus*) very short; trochanters normal, elongate in most Ceryloninae, Ostomopsinae while weakly to markedly oblique in remaining forms; protibia often dentate at outer-apical angle, rarely protibia crenulate or denticulate along the outer margin (*Axiocerylon* part, *Glyptolopus*); legs, especially hind legs, long to very long in *Loebliorylon* with femora and tibiae often serrate (fig. 74C, 75D, G), crenulate or dentate on inner surfaces; tarsi 3-3-3 or 4-4-4 (fig. 5B, D), tarsomere I lobed below in several genera of Euxestinae (fig. 68I), weakly lobed in *Gyreleon* and *Angolon* (Ceryloninae); claws simple; bisetose empodium present or absent.

Abdomen. Five visible and freely articulated sternites (ventrites); ventrite I (sternite 3) usually as long as the following two combined, often with femoral lines; intercoxal process of ventrite I usually wide and truncate anteriorly so the coxae are widely separated, in *Loebliorylon* it forms a peculiar plate covering the coxae from below (fig. 74E); ventrites II-V with internal apodemes on anterior angles (fig. 4D, 7A). Abdominal spiracles on segments 1-7 in Euxestinae, 1-5 (fig. 4C) in remaining subfamilies, in Euxestinae their openings are oval and much more sclerotized than the circular ones in the remaining subfamilies. Apical ventrite (sternite 7) often inflexed with hind margin crenulate (fig. 16E), crenulation may be simple (in Ceryloninae) consisting of simple ridges on the hind margin of ventrite (fig. 18F) or consist of specialized structures found in Ostomopsinae and Murmidiinae (fig. 18E); the corresponding crenulation beneath the elytral apices (fig. 18C, D), and apically widened and longitudinally ridged elytral flanges (fig. 16F) in *Ostomopsis*, form an interlocking mechanism of the elytra. Tergite VII usually moderately strongly sclerotized and apically setose, rounded or weakly pointed apically, in males of *Austriorylon* modified (fig. 99C-D), crenulate on posterior margin and fitting into deep emargination of the sternite VIII. Sternite VIII in female weakly sclerotized, membranous, in *Loebliorylon* and all Ceryloninae with long articulated spiculum gastrale (fig. 7C, 8A, B); in male largely reduced and without anterior process, except for *Loebliorylon* (fig. 75I). Sternite IX in male of Murmidiinae and Ostomopsinae usually with a lobe or paired apophyses (fig. 7B),

Ovipositor (fig. 7C, 8-10, 76C) moderately to strongly elongate (*Gyreleon*) with well developed styli in *Loebliorylon*, Ceryloninae and Euxestinae, while markedly reduced without styli in Murmidiinae. Aedeagus consists of median lobe (penis proper) and tegmen bearing more or less developed parameres. In *Ostomopsis* the median lobe is long, weakly sclerotized with paired dorsal struts (fig. 81B), while in the remaining subfamilies the median lobe is more or less sclerotized, always asymmetrical and without struts. In Euxestinae the median lobe is relatively long (fig. 64C), laminate and much less strongly sclerotized than in Ceryloninae. The tegmen is symmetrical in Ostomopsinae, Murmidiinae (fig. 7B) and Loebliorylinae, while asymmetrical in Euxestinae and Ceryloninae; in *Ostomopsis* and *Loebliorylon* (fig. 76B) the tegmen bears long articulated strut, while in Murmidiinae the strut is largely reduced to a lobe (fig. 77G, 78F); in Euxestinae the tegmen forms a dorsal, usually asymmetrical lobe lying above the median lobe. In Ceryloninae the tegmen is markedly reduced, sometimes obsolete, and rarely bears a ventral ring-like structure. The parameres are well-developed and articulated in some Murmidiinae, in *Pseudodacne* (Euxestinae), and non-articulated parameres often are present in Ceryloninae.

B) LARVAL CHARACTERISTICS

Differences between subfamilies is considerable, so larvae are discussed subfamily-by-subfamily.

Subfamily EUXESTINAE

Length 3.0-5.5 mm. Body elongate, more or less parallel-sided, slightly flattened and lightly pigmented. Dorsal surfaces densely granulate and asperate. Vestiture of various combinations of long pointed setae or moderately long weakly clubbed or apically expanded setae (fig. 19A, 21A); the setae are never strongly expanded or scale-like.

Head protracted and prognathous, partly covered by protergum, moderately broad, weakly transverse (fig. 19F), clothed with short and long pointed setae and dense, irregular asperities. Epicranial suture absent. Median endocarina absent. Stemmata on each side 2 (*Hypodacnella*) or 0 (*Euxestus*, *Euxestoxenus*). Antenna moderately long, about $0.2-0.3 \times$ as long as head width, situated on well developed

basal membrane; 3-segmented (fig. 19C, 21E), with antennomere II distinctly longer than I, bearing apical sensory appendage that is longer than segment III and more or less lateral to it; antennomere III bearing several long setae; in *Euxestoxenus chappuisi* the antenna is reduced to a small 1-segmented not apically setose cone (JEANNEL and PAULIAN 1945). Frontoclypeal suture not distinct. Labrum free, trapezoidal, weakly narrowing anteriorly, and shallowly emarginate antero-medially, bearing 4 long dorsal setae and several gustatory sensilla laterally. Epipharynx (fig. 21G) with apical brush of hairs reduced to absent, two inwardly curved dense bands of setae surrounding markedly sclerotized and sparsely setose area; sometimes (*Euxestus*) followed by a smaller second one; 5-6 sensilla anteriorly; cibarial membranes bearing 13-16 oblique plates. Tormae well developed, moderately strongly sclerotized and joined anteriorly to a transverse, sclerotized bar. Mandibles symmetrical, 2-3 teeth apically, if bidentate (*Euxestus*) then with blunt subapical tooth on incisor edge, ventral accessory process moderately to strongly developed (fig. 21C). Mola strongly developed, asperate, with 6 transverse rows of asperities extending into ventral surface (in *Euxestus* also very fine dorsal ridges). Prostheca absent, base of mandible with brush of setae. Ventral mouthparts retracted. Maxilla with transverse cardo (fig. 20A, 21 D), elongate stipes and slender, somewhat falciform mala bearing several apical spines and long setae along inner margin; maxillary articulating area well developed, oval. Maxillary palp 3-segmented, moderately elongate, apical segment bearing single peg seta ventrally and minute papillae apically. Labium with short, transverse ligula bearing two apical setae and two pores; labial palp 2-segmented, without peg-setae. In *Hypodacnella* hypopharyngeal sclerome well developed (fig. 21B) and hypopharyngeal rods visible, moderately long and divergent, lightly sclerotized, otherwise absent.

Thorax and abdomen. Thoracic and abdominal terga covered with various combinations of granules, tubercles, setae and sharp asperities. Thorax relatively large, about $0.4 \times$ as long as abdomen, with (*Hypodacnella*, *Euxestoxenus*) or without (*Hypodacne*, *Euxestus*) lateral processes. Abdominal terga 1-8 similar in shape, with or without lateral processes. Tergum 9 bearing long, paired, more or less diverging and not upturned urogomphi that are extremely developed and branched in *Hypodacnella*, reaching $0.7-0.9 \times$ body length, almost simple and short in *Euxestus* and *Hypodacne*. Segment 10 vertical.

Spiracles on mesothorax and abdominal segments 1-8 more or less annular-biforous type, in *Hypodacnella* situated on distinct processes (fig. 19D, E) with accessory opening much longer than main opening; in *Euxestus* spiracles are only slightly prominent and not completely divided into main and accessory openings. Legs moderately stout, widely separated; tarsungulus unisetose (fig. 19B).

Material examined - *Euxestus erithacus* (Chevrolat) - several larvae associated with adults from «Jamaica, Brandon Hill Cave, 1.XI.1974, bat guano, S.B. Peck» (IZPAN); *Hypodacnella* sp. - 5 larvae associated with adults from «Australia, Queensland, Lamington N. Pk., O'Reillys, 22-27.X.1978, Berlese 665, J.F. Lawrence & T. Weir (IZPAN); *Euxestus* sp. - 2 larvae associated with adults from «Australia, Queensland, Mt. Tozer, 11-16.VII.1986, T. Weir & A. Calder» (IZPAN).

Subfamily MURMIDIINAE

Length 1.8-2.2 mm. Body broadly-oval, strongly flattened disc-like (fig. 22A) and lightly pigmented. Dorsal surface densely granulate and asperate. Vestiture of various combinations of long pointed setae, long and short barbed setae.

Head hidden under pronotum, prognathous, including labrum about $1.1 \times$ as long as wide. Epicranial suture absent. Median endocarina present (fig. 23B). Stemmata absent. Antenna relatively long, about $0.4-0.5 \times$ as long as head width, situated on well developed basal membrane; 3-segmented (fig. 23D) with antennomere II $0.75 \times$ as long as I, bearing apical sensory appendage that is longer than segment III (excluding apical setae) and more or less lateral to it; antennomere III bearing several long setae. Fronto-clypeal suture absent. Labrum free, trapezoidal, weakly narrowing anteriorly, shallowly emarginate antero-medially, bearing two rows of inwardly curved bands of setae, two apical and four median sensilla. Epipharynx with triangular, setose area; cibarial membrane somewhat irregular, bearing about 10 oblique plates; tormae moderately strongly sclerotized, joined anteriorly to a transverse, sclerotized bar. Mandibles symmetrical, tridentate apically, ventral accessory process moderately strong (fig. 23A). Mola strongly developed, asperate, with 9 transverse rows of asperities extending onto ventral surface. Prosthema hyaline, broad based. Ventral mouthparts retracted. Maxilla (fig. 23E) with elongate cardo, short, trapezoidal stipes and blunt mala bearing long

setae apically and along inner margin; maxillary articulating area well developed, oval. Maxillary palp 3-segmented, moderately elongate, apical palpomere longest, without peg setae, with minute papillae apically. Labium (fig. 23C) with short, transverse ligula bearing two apical setae and several sensilla; labial palp 2-segmented, without peg setae. Hypopharyngeal sclerome well developed; hypopharyngeal rods absent.

Thorax and abdomen. Thoracic and abdominal terga covered with various combinations of granules, turbeccles, setae and sharp asperities. Thorax large, about as long as abdomen, with lateral processes. Abdominal terga 1-8 similar in shape, becoming shorter and more angulate medially, with short lateral processes bearing pair of lateral glandular openings. Tergum 9 triangular, weakly emarginate posteriorly, without urogomphi. Segment 10 vertical. Spiracles on mesothorax and abdominal segments 1-8, annular, situated below lateral processes. Legs moderately stout, widely separated; tarsungulus unisetose.

Material examined - 25 larvae of various instars (including final) of *Murmidioides ovalis* (Beck) from cultures in the Slough Pest Control Laboratory (IZPAN) and from collection of the Zoological Museum in Copenhagen.

Subfamily CERYLONINAE

Length 1.2-3.5 mm. Body elongate, more or less parallel-sided or slightly onisciform (*Mychocerus*), moderately flattened and lightly pigmented. Dorsal surface densely asperate, rarely with minute granules as well. Vestiture of various combinations of long or short scale-like, often apically divided (fig. 24) setae or moderately long, pointed setae (*Cerylon*). Head more or less ophistognathous and largely hidden under prothorax, moderately broad, weakly transverse (fig. 25A, 27D), clothed with short and long pointed setae, sparse scale-like setae or combination of both types (*Philothermus*). Epicranial suture absent. Median endocarina absent. Stemmata absent. Antenna moderately long, about $0.30-0.45 \times$ as long as head width, situated on well developed basal membrane; 3 segmented (fig. 25C, 26E, 27E), with antennomere II only slightly longer or subequal to I, bearing long and curved sensory appendage that is often longer than segment III and II combined, more or less situated laterally to segment III;

antennomere III bearing two or three long setae. Fronto-clypeal suture absent. Labrum fused to clypeus, strongly elongate and pointed apically (*Philothermus*, *Mychocerus*) or trapezoidal (*Cerylon*), usually with two long setae at base (fig. 26B). Epipharynx and tormae not distinct. Mandibles stylet-like and either endognathous (*Cerylon*) or enclosed within tubular beak (*Philothermus*, *Mychocerus*), symmetrical (fig. 25A, 26F); prostheca absent. Ventral mouthparts in *Cerylon* and in unassociated larva from Java (fig. 17A, B, 29B) strongly modified: maxilla without distinct cardo; mala blade-like; maxillary palp 3-segmented, long; labium reduced with palps 1-segmented (*Cerylon*), or moderately elongate with characteristic 2-segmented palps in the Java specimens (fig. 29A). In remaining known genera maxillary cardo elongate and mala, palpi and labium strongly elongate and united within a tubular beak (fig. 25A). Mola and maxillary articulating area absent. Hypopharyngeal sclerome absent.

Thorax and abdomen. Thoracic and abdominal terga covered with various combinations of granules, tubercles, setae and pointed asperities (fig. 26D, 27A, B). Thorax usually about $0.5 \times$ as long as abdomen, without distinct lateral processes. Abdominal terga 1-8 similar in shape, often weakly expanded laterally to form posteriorly projected processes covering spiracles from above. Tergum 9 usually transverse, sometimes emarginate posteriorly (fig. 24, 26C), without urogomphi. Segment 10 vertical, forming a pygopod. Spiracles on mesothorax and abdominal segments 1-8, annular (fig. 26D). Legs (fig. 25B, 27F) short, widely separated; tarsungulus unisetose.

Material examined - *Cerylon histeroides* - 15 larvae from Poland (Lomna ad Warszawa) collected several times under rotting bark of birch (S.A. Slipinski, IZPAN); *Cerylon ferrugineum* - 5 larvae from Poland (Bialowieza N.P.) collected with associated adults under bark of linden tree (S.A. Slipinski, IZPAN); *Philothermus glabriculus* - 5 early instar larvae associated with adults from «USA, Indiana, Parke Co., 4 mi W of Waverland on rt. 47, 12.XI.1974, FM(NH) 74, H.S. Dybas» (FMNH, IZPAN); *P. floridensis* - 5 mature larvae associated with adults from «USA, Florida, Leon Co., Chaires, 29.VIII.1965, FM(NH) 65-132, sawdust pile, W. Suter» (FMNH, IZPAN); same species, 3 larvae not associated with adults «USA, Georgia, Chariton Co., St. George, 18.VIII.1965, FM(NH) 65-387, hay stack and sawdust pile in town, W. Suter» (FMNH); *Mychocerus hintoni* - 6 mature larvae associated with adults from «Mexico, Talisco, Querto Los Maroz, 10 mi SW Antlar,

4400', 25.IX.1973, ex refuse deposit of *Atta mexicana*, A. Newton» (MCZ; IZPAN); *M. newtoni* - 3 mature larvae associated with adults from «Mexico, Veracruz, Canyon Rio Metlac, near Fortin, 3200', 28-31.1973, leaf and log litter under decaying mangroves, A. Newton (MCZ); unassociated Ceryloninae - about 25 larvae of *Philothermus-Mychocerus* complex with piercing mouthparts from various samples taken in Mexico by A. Newton (MCZ); 3 larvae with endognathous mandibles from Java (one figured with scanning electron photographs, fig. 17A, B), associated with adults of underscribed *Pseudocerylon* and *Gyreleon* collected by J. Robert (MHNG).

C) BIOLOGY AND HABITATS

Available information concerning habits and habitats of Cerylonidae is scarce and mostly limited to the «broad» habitat that specimens were taken from. Most of the recently collected specimens come from mass-sampling methods (Berlese funnels or Winkler extractors) lacking data on specific habitats.

The most frequent habitats are leaf litter, rotten wood, forest debris and fungus-infested bark, and the microphthalmous and wingless *Loebliorylinae* are found exclusively in such habitats. The gut contents of several genera and species were examined on slides but often the particles were impossible to identify. *Philothermus*, *Gyreleon*, *Euxestus*, *Euxestoxenus*, *Axiocerylon*, *Australiorylon*, *Murmidius*, *Ostomopsis* and others seem to feed on fungal spores, hyphae and other organic matter that were impossible to identify. Very often the proventriculus or the hind gut is entirely filled by dark pigmented substrates containing different, apparently organic, particles of fungi or detritus. Several gut dissections were made in species with extremely elongate mouthparts (*Philothermus floridensis*, *Cautomus* spp., *Rostrorylon vaucheri*) and almost always the gut contents showed fungal hyphae, spores or other dark-pigmented matter, which supports the idea by LAWRENCE and STEPHAN (1975) that these beetles are not predators as suggested by BESUCHET (1972). Examples of Ceryloninae larvae living in this habitat are *Philothermus glabriculus*, *P. floridensis*, several associated or unassociated *Mychocerus*, and an unassociated larva from Java. All the larvae mentioned, except for the Javan one, have mouthparts of the piercing type with the labrum and labium forming a tubular beak (fig. 25A, 29B), and the mandibles and the

mala are both modified into narrow stylets. The construction of the mouthparts, with an enlarged pharynx, seems to prove that they work as a piercing-sucking pump. It is unlikely that such larvae are predators (gut contents were never visible) because of the strongly hypognathous head so predation would be impossible on active, small prey. The most probable food sources for the larvae are wood juices or fungal hyphae that are penetrated by these beaks and digested extraorally. Larval gut contents of Euxestinae (*Euxestus* and *Hypodacnella*) contain a variety of spores, fungal hyphae and unidentifiable matter. This seems to be the food source for most larvae with a well developed mandibular mola, ventral tubercle and sclerotized epipharynx.

Some cerylonids are occasionally found in special habitats. A few species of Ceryloninae and Euxestinae are associated with ants and termites. The Australian *Cautomus mirabilis* (Oke) was originally found in nests of an *Amblyopone* ant, but recently collected specimens come from various habitats including sclerophyll and rain forest leaf litter. The ant association was probably accidental. *Mychocerus hintoni* seems to be found exclusively in refuse deposits of leaf-cutting ant *Atta mexicana*, since I have never seen this species from other habitats. *M. parallelus* (Slipinski), on the other hand, was represented in a single sample with associated ant whereas most of the material was from under bark in Panama or extracted from litter under trees. *Hypodacne punctata* LeConte was found in galleries of the carpenter ant *Camponotus* in southern Ontario; specimens were observed crawling on walls of ant galleries (STEPHAN 1968) but nothing is known about their relationships and biology or the larva. *Hypodacne edithae* was described from Talysh (USSR) and its larvae and adults were found under bark of willows (*Salix*) (NIKITSKY and BELOV 1979). *Euxestoxenus myrmecophilus* (John) and an underscribed species from Thailand were associated with *Myrmecaria* nests (JOHN 1963), and adults of these species show some features (short and compact antennae, almost glabrous dorsum, body more convex dorsally, antennal and tarsal grooves on tibiae well developed) suggesting myrmecophily. Another species of *Euxestoxenus* (*chappuisi*) has been found in nests of the mole-rat (*Tachyoryctes*). Its larva has strongly reduced antennae and no stemmata (Jeannel and Paulian 1945) which may be adaptations to this special habitat. The adult does not show any specialized characters. Cerylonid-termite associations are limited to fungus-eating

termites (mostly *Odontotermes*) and to the subfamily Euxestinae. *Cycloxenus hispidus* Arrow (1925) was taken from brood-chambers of termites in company with larval hosts. The beetles were probably feeding upon the fungus provided for immature termites. *Euxestoxenus striatus* Arrow and several other underscribed species of *Euxestoxenus* and *Cycloxenus* were found in the same association in South Africa and Indo-Malaysia by D. KISTNER (personal communication), while a large underscribed species of the latter genus was extracted from leaf litter in Nepal.

The second important habitat of cerylonids is under bark. This group is mostly represented by members of the subfamilies Ceryloninae and Murmidiinae. The Holarctic genus *Cerylon* seem to be confined to this habitat. Other genera found under bark are *Philothermopsis*, *Philothermus*, *Mychocerinus*, and rarely *Mychocerus* and *Botrodius*. My own observation on various species of *Cerylon* in Poland led me to the conclusion that there are some specific requirements for every species of the genus choosing the tree species and a particular rotting bark stage. *Cerylon deplanatum* almost exclusively occurs under bark of freshly logged *Populus* (mostly *P. tremula*) where the phloem is just fermenting. Adults were easy to find in such conditions, but I have never found larvae there. *Cerylon histeroides* seems to be more tolerant, occurring on many species of deciduous trees in different stages of rotting, but larvae were found only on birch (*Betula*) under moderately rotten bark. The whitish, slightly onisciform larvae occur in May to June, usually in small groups in crevices of fresh and sappy bark. Their actual food source, however, remains unknown as I was unsuccessful rearing them in these conditions. Rearings were successful (BURAKOWSKI and SLIPINSKI 1986; B. BURAKOWSKI, personal communication) on a growing Mycetozoa plasmodium. The larvae moved slowly on the plasmodial surface and probably pierced the substrate that was digested extraorally. Before pupation the larva leaves the plasmodium and makes a loose, silk pupal cocoon (fig. 28), similar to that of *Bothrideres*. The larvae of *Cerylon* differs from the *Philothermus-Mychocerus* type in having the head opisthognathous, with the labium short and fused to the prothorax, mandibular and maxillary stylets (fig. 27) short, completely enclosed within the head and attached to a heavily sclerotized internal framework. This type of mouthpart is remarkably similar to endognathous apterygote insects (LAWRENCE and STEPHAN 1975; TUXEN 1959). An intermediate

condition occurs in the inassociated Ceryloninae larva from Java (fig. 29A, B). Its mouth-parts are moderately elongate, the labrum emarginate apically, mandibular and maxillary stylets completely endognathous, and the palps are markedly elongate. The food source is unknown, but it was extracted from a leaf and log litter sample. The subcylindrical adults of African *Metacerylon* were associated several times with tunnels of wood-boring insects (SCHEDL 1962). The larva may be living in tunnels of ambrosia beetles or other groups, analogous to the larvae of Teredinae (Bothrideridae). Adults are highly variable, and those found in the tunnels show some adaptations to this specific habitat (subcylindrical body, protibiae expanded and spinose apically, elongate ovipositor, comparatively shorter antennae and legs) analogous to those found in Bothrideridae (Bothriderinae and Teredinae).

Finally, cosmopolitan *Murmidius ovalis* (HINTON 1945, HALSTEAD 1968) and one or two species of African *Euxestoxenus* (JOHN 1968) were associated with stored products of man, but none of them are regarded as a serious pest.

D) PHYLOGENETIC RELATIONSHIPS

The cladistics is generally adopted here as a methodology of estimating the relationships between taxa (HENNING 1966, ELDREDGE and CRACRAFT 1980, NELSON and PLATNICK 1981, WILEY 1981, WHEELER and BLACKWHEEL 1984). Due to limited information from several groups apparently related to Cerylonidae and because of several projects in progress that hopefully will produce new characters for the classification of the entire «celylonid-group», the classification proposed in the following sections does not reflect all the ideas generated by the cladistic analysis. The analysis of characters were done using outgroup comparisons with taxa presumed to be closely related to Cerylonidae, such as Bothrideridae (Xylariophilinae and Teredinae), Alexiidae, Endomychidae (Mychotheninae, Eupsilobiinae) and Discolomidae. If both states of a character was found in the outgroup, the polarity was determined by functional outgroup comparisons (WATROUS and WHEELER 1981).

For the cladograms presented below, the numbers refer to the characters discussed, with the apomorphic condition listed first and the plesiomorphic condition following in parentheses.

(1) CERYLONIDAE

SEN GUPTA and CROWSON (1973), LAWRENCE and STEPHAN (1975), LAWRENCE (1982), PAL and LAWRENCE (1986) and SLIPINSKI (1988a) characterized the family. The family defined by: (1) antennal insertions exposed; (2) scape and pedicel markedly asymmetrical and the pedicel inserted ventrally on the scape; (3) antennal club more or less compact and usually not more than 2-segmented; (4) corpotentorium with median process; (5) procoxae externally small and rounded with concealed lateral extensions; (6) tronchanters elongate or weakly heteromeroid; (7) tarsal formula 4-4-4 or 3-3-3; (8) tarsomere simple or rarely the first lobed below; (9) claws simple; (10) wing without radial cell, with single a-vein, or if with more a-veins then first running into the subcubital fleck; (11) aedeagus with the median lobe lying on its side, usually with reduced tegmen; (12) larva without or with weakly developed frontal sutures, stemmata 0 or 2, urogomphi absent or long and divergent.

When critically examining the characters of Cerylonidae and Bothrideridae, PAL and LAWRENCE (1986) found that no clear separation between the two families was possible. They could not separate Metaceryloninae and Euxestinae from Bothrideridae (Annomatinae, Teredinae, Xylariophilinae) on a simple, clear-cut base. From their data matrix of all subfamilies of Cerylonidae, Bothrideridae and other groups, it is clear that neither Cerylonidae nor Bothrideridae are defined by synapomorphies, and that most of the characters used for the Cerylonidae definition (above) are symplesiomorphies shared with other members of the cerylonid-group. A similar problem arises for Bothrideridae, as there are no synapomorphies linking the apparently less advanced forms (Xylariophilinae, Teredinae, Annomatinae) with the advanced Bothriderinae. The radial cell found in some Bothriderinae (otherwise not known in the cerylonid-group) precludes derivation of this group from Xylariophilinae or Teredinae.

Little new information was published since, so many that of Pal and Lawrence's problems are still present, in addition to several new ones. The hypothesis that Cerylonidae and Bothrideridae are certainly paraphyletic, which is presented below was not considered thoroughly by former students and therefore should be tested with more material. As mentioned above (systematic position, p. 19) there is no group in the cerylonid complex, except for Cerylonidae, with two states (5 or

7 pairs) of abdominal spiracles. As this character is paralleled by other features, it is significant in defining natural groups (families). Unlike other subfamilies of Cerylonidae, Euxestinae (including Metaceryloninae) have 7 pairs of functional abdominal spiracles. This character is shared with Bothrideridae, Latridiidae and Corylophidae. Based on the reduced lacinia in the adults, and larvae without urogomphi and maxillary articulated area, corylophids and latridiids are probably not closely related to Bothrideridae or Euxestinae, and their relationships within the cerylonid-group remains unclear. The Euxestinae share with most Bothrideridae (at least with Teredinae and Xylariophilinae) several characters. These are (probable plesiomorphies (-) or synapomorphies (+)): fronto-clypeal suture present (-); corpotentorium with median process (-); outer and mesal arms of tormae separated (-); mesocoxal cavities closed externally (+); wing with jugal lobe present (-); troncchanters heteromeroid (+); tibial apex often expanded and spinose (+); abdomen with 7 pairs of spiracles (-); ovipositor with distinct styli (-); larva with mandibular prostheca reduced (+); urogomphi present (+); spiracles not annular (+); spiracles on tubes (+).

It is apparent that most of the similarities involve plesiomorphies shared with other families of the cerylonid-group. However, the annular-biforous type of larval spiracles that are often situated on short processes are not found in larvae of Cerylonidae, Murmidiinae, Endomychidae and Coccinellidae, but is found in free-living Bothrideridae (Teredinae, Xylariophilinae) and in *Sphaerosoma*. A possible autapomorphy of Euxestinae are the urogomphi which are relatively long, divergent apically, not upturned and often complex, while they are short and hooked in Teredinae, Xylariophilinae and *Sphaerosoma*. The character used to separate Bothrideridae from Euxestinae (PAL and LAWRENCE 1986) in the adult stage is the specific structure of a tegmen in Bothrideridae with more or less articulated parameres and articulated ventral strut, as opposed to inarticulated parameres and dorsal tegmental lobe in Euxestinae. However, the parameres in *Pseudodacne* are articulated, and the whole aedeagal structure in Bothrideridae is plesiomorphic, and therefore of no significance. The dorsal lobe and inarticulated parameres occur in *Sphaerosoma* and probably constitute synapomorphies linking *Sphaerosoma* and Euxestinae. *Sphaerosoma* larvae have 5 stemmata, the mandible with basal asperate mola, broad based prostheca, hypostomal rods, hooked

urogomphi (all plesiomorphies) and annular-biforous spiracles situated on short tubes (synapomorphies?) that are shared with Euxestinae, Xylariophilinae and Teredinae. These are arguments to exclude Euxestinae (including Metaceryloninae) from Cerylonidae and to place them tentatively as a subfamily in Bothrideridae, possibly with *Sphaerosoma*.

The monotypic Ostomopsinae was placed as a tribe in Murmidiinae by SEN GUPTA and CROWSON (1973) and elevated to subfamily level by LAWRENCE and STEPHAN (1975). The relationships of *Ostomopsis* to the remaining subfamilies of Cerylonidae are unclear. The former is included here in this family because of the crenulate margin of the last abdominal ventrite. Autapomorphies of *Ostomopsis* include a peculiar antennal club that is emarginated laterally and bears specialized sensilla, the peculiar form of maxillary palps exclusive for the genus, the pronotal edges serrulate and the apical flange of elytra widened apically and longitudinally striate. The last character is unique within the cerylonid-group but found in some other Cucujoidea (Passandridae, Cryptophagidae). The aedeagal type of *Ostomopsis* with a median lobe bearing dorsal struts and tegmen with articulated strut is primitive, but is probably not homologous with a similar type found in Bothrideridae. The structure of tibiae, tarsi and coxae are similar to Endomychidae (Mychotheninae) that also have serrate pronotal margins, tentorial arms meeting anteriorly and tegmen with ventral strut (but with reduced median lobe). The larva of *Ostomopsis* may provide characters to place the taxon. It is apparently related to Murimidiinae (palpi non-aciculate, fronto-clypeal suture present, tegmen symmetrical) and to Ceryloninae (wing without subcubital fleck, procoxal cavities internally widely open with the intercoxal process narrow and parallel-sided, spiculum gastrale present, ovipositor with well developed styli, dorsum setose). But none of the characters could be, so far, regarded as a convincing synapomorphy with any of the remaining subfamilies. Except for the symmetrical tegmen and ventral tegminal strut there are no significant characters linking *Loebliorylon* and *Ostomopsis*.

The position of the monotypic subfamily Loebliorylinae is discussed above in the chapter on the systematic position of the family (p. 21). The symmetrical tegmen with a long strut and smooth last abdominal ventrite suggests that this genus may be the sister group of the Ostomopsinae, Murmidiinae + Ceryloninae. The aedeagus of

the Murmidiinae and Ceryloninae could easily be derived from *Loebliorylon*; the one of *Ostomopsis* is more primitive with the median lobe bearing paired dorsal struts. Another possible synapomorphy may be the aciculate palpi and lack of fronto-clypeal suture linking Ceryloninae and *Loebliorylon*. The smooth last abdominal ventrite, prosternal process largely reduced and not reaching behind coxae, intercoxal process of ventrite I dorsally expanded, partially covering the coxae that are approximate; femora and tibiae markedly elongate, constitute synapomorphies for *Loebliorylon*. If *Loebliorylon* is regarded as the sister group of Ceryloninae (because of the aciculate palpi and fronto-clypeal suture absent), the tegminal strut and smooth ventrite would represent a reversal (tegminal strut) and a secondary loss (crenulation). The larva of *Loebliorylon* may provide characters for placing this taxon.

The largest and best defined group among the Cerylonidae is the subfamily Ceryloninae. Adults of Ceryloninae are distinguished by the lack of fronto-clypeal suture, aciculate palpi and crenulate last ventrite. The first two characters may not be homologous with those of *Loebliorylon*. The crenulate ventrite is also present in Murmidiinae and Ostomopsinae, but may not be homologous in these groups because of different structures involved (see p. 31). More convincing synapomorphies are provided by larvae of Ceryloninae with mandibles without mola, blade-like and enclosed within a tubular beak or endognathous, with hypostomal rods, the maxillary articulating area and stemmata absent. In the absence of larvae of *Ostomopsis* and *Loebliorylon* the phylogenetic significance of these specialized mouthparts remains unknown. These specialisations consists mostly of reductions. Ceryloninae are possibly more generalized within Cerylonidae as generally assumed. Some adult characters (spiculum gastrale well developed and articulated, the ovipositor with long styli, the parameres often present and setose) the (except for the mouthparts) plesiomorphic type of larva, and doubtful significance of adults palps and crenulation of the last ventrites leaves the relationships between subfamilies of the Cerylonidae unresolved.

(2) EUXESTINAE

Euxestinae are a monophyletic group. The characters uniting them are a unique type of aedeagus with dorsal asymmetrical tegminal

lobe lying above the median lobe which is long, laminate and lacks strut (similar to that of *Sphaerosoma*), metendosternite with laminae originating out on lateral arms and widely separated from anterior tendons; larva with long, divergent and not upturned urogomphi and with no more than 2 stemmata. As the systematic position of the group is uncertain, the characters are polarized by using Bothrideridae and *Sphaerosoma* as the closest relatives, and the Biphyllidae and Byturidae as distantly related outgroups. Below I list the characters used for the cladistic analysis Euxestinae.

(1) Antenna 7-10-segmented (11-segmented). The 11-segmented antenna is plesiomorphic for Coleoptera in general. The plesiomorphic state is found in *Pseudodacne* and *Protoxestus*, and in most members of Bothrideridae (Teredinae, Xylariophilinae, Annomatinae), Byturidae and Biphyllidae. *Sphaerosoma* and most of remaining Euxestinae have 10-segmented antenna, with a solid club formed by fused two apical antennomeres. The reduction of antennomeres has probably occurred many times in Cerylonidae; in *Metacerylon* there are species having 10, 9, 8 and 7-segmented antenna.

(2) Antennal club 1-2 segmented (3-segmented). Three segmented club of *Protoxestus* is unique within the subfamily, and the reduction process to produce a club of 1 or 2 segments has occurred several times.

(3) Antennal club apparently 1-segmented (3 or clearly 2). This state is a continuation of the previous transformation series; however, the club of *Pseudodacne* (flat, with both club-segments subequal) is probably a derived state.

(4) Antennal club asymmetrical (symmetrical). In the cerylonid-group the antennal club is more or less symmetrical and multisegmented. The strongly flattened and asymmetrical club in *Euxestoxenus*, *Cycloxenus* and *Bradycycloxenus*, represent a uniquely derived character proving the monophyly of these taxa. The flattened club is received by strongly concave hypomerion or a cavity. The weakly asymmetrical club in *Globoeuxestus* is probably independently derived, from *Euxestus*-like ancestors.

(5) Antennomere III as long as IV (at least $2 \times$ as long as IV). In Euxestinae there are two distinct states of length of antennomere III: very long, about $3 \times$ as IV; and very short, subequal to IV. The intermediate stage (ca $1.5 \times$ as long as IV) is found in most of other related taxa and is probably plesiomorphic for the cerylonid-group.

(6) Prosternum distinctly emarginate laterally to form antennal grooves (prosternum simple). The polarity of this character is uncertain. In Biphyllidae, Byturidae, Bothrideridae and *Sphaerosoma* the cavities are absent, while they are always present in Murmidiinae and often in Ceryloninae. The emargination of the prosternum, sometimes extending onto hypomeron as cavities, producing antennal grooves probably occurred many times, and there were possible reversals. In *Hypodacnella* retracted, coiled antenna (fig. 64A) is received mostly by lateral portions of prosternum near anterior angles, and not by concave hypomeron, and this may be the plesiomorphic state for Euxestinae.

(7) Prosternum with additional admedian lines (without lines). Admedian lines in Euxestinae occur only in *Hypodacnella* but also in some Murmidiinae and Ceryloninae.

(8) Prosternum carinate antero-medially (prosternum flat). This is an autapomorphy for *Globoeuxestus* not found in other Euxestinae. However, it occurs in Ceryloninae (*Ellipsorylon*, *Ploeosoma*).

(9) Prosternal process narrower than coxa (prosternal process much wider than coxa). This is an adaptive character with uncertain polarity. It is probably independently derived in *Cycloxenus*, *Meta-xestus* and some *Metacerylon*; in the last genus the flattened forms have the prosternal process wide (fig. 72C, D).

(10) Prohoracic hypomera with antennal cavities at least partly defined (without cavities).

(11) Hind corners of prothorax projected into lobes over shoulders of elytra (normal). It is found in *Bradycycloxenus* and apparently is a derived state occurring in some Eupsilobiinae (Endomychidae) and to some extent in an underscribed species of *Philothermus*.

(12) Metasternum with femoral lines (without lines). The distribution of femoral lines in Cerylonidae and other groups of Cucujoidea is largely enigmatic; they are found in Biphyllidae, rarely in Endomychidae, in *Sphaerosoma*, in most Coccinellidae, all Murmidiinae and some Ceryloninae. They are absent in both *Protoxestus* and *Pseudodacne*, presumably the most generalized euxestines.

(13) Ventricle I with femoral lines (without lines). The very fine and laterally extending femoral lines in *Hypodacnella*, all Murmidiinae and some Ceryloninae (*Myhocerus*, *Neolapethus*) are probably non-homologous with the short and almost straight ridges of *Metacerylon*,

several Ceryloninae, Bothrideridae and Biphyllidae. The last represent probably derived stages, but polarity of this character is uncertain.

(14) Dorsum densely and coarsely punctured with elytra densely but irregularly punctate (dorsum smooth or elytra finely punctate, punctures usually regular). Occurring only in *Cycloxenus*, this may be an adaptation to termitophily.

(15) Wing without subcubital fleck and no more than 2 a-veins (wing with subcubital fleck and 3 a-veins). The first represents a derived condition but this reduction may have occurred independently many times in the cerylonid-group. This stage is postulated here to be of an independent origin in *Metacerylon* and *Globoeuxestus*.

(16) Tarsomere I broadly lobed below (simple). Lobed tarsomeres are often found in Endomychidae, Corylophidae and Coccinellidae, but usually the first tarsomere is simple. In *Gyreleon* and *Angolon* of Ceryloninae tarsomere I is weakly lobed, while in many Euxestinae it is strongly widened and prominent. In two species of *Oroussetia* markedly lobed tarsomere occur in the male protarsi only. In *Pseudodacne* and in two species of *Hypodacnella* the first tarsomere is weakly projected, but not markedly lobed, the lobe is sometimes reduced in *Euxestoxenus* as well.

(17) Ventrites with lateral lobes (simple). The lobed ventrites often occur in Euxestinae (with the maximum development in *Metacerylon*) and in several Bothriderinae. It consists of an interlocking mechanism with depressions on the epipleura receiving the lateral expansions of abdominal ventrites. The lobed ventrites in different genera are probably non-homologous.

(18) Median lobe sclerotized (weakly sclerotized and laminate). In *Metaxestus* the median lobe is sclerotized and often spiral, while in *Pseudodacne* the median lobe is typical for the subfamily and markedly sclerotized. The polarity of this character is uncertain, but the sclerotized penis seems to be derived at least within this complex.

(19) Parameres obsolete (parameres distinct). Well developed parameres are known only in *Pseudodacne* (*Protoxestus* not examined), and the reduction is a derived character, that has occurred many times within Cerylonidae.

(20) Protibia expanded apically and spinose (simple). This character appears only in *Metacerylon* with the maximum development in the subcylindrical forms which live in galleries of wood-boring

insects. This characetr is probably non-homologous with the spinose and markedly expanded tibiae bearing unequal spurs of Bothrideridae.

A cladogram of Euxestinae genera is given in figure 30 and underlying data matrix in table I. Numbers refer to characters discussed above. The not-boldface numbers indicate multiple derived characters. In *Metacerylon* both states of character (9) are found. The character is coded as plesiomorphic as the latter state occurs in those species that are assumed to be plesiomorphic. The cylindrical forms are probably secondary adaptations to the tunnels of a wood-boring insects.

Table I - Character distribution of Euxestinae genera and *Sphaerosoma*, Tereidinae and Xylariophilinae. (0 = plesiomorphic; 1 = apomorphic; × = not examined or not applicable)

Genus	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Protoxestus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Pseudodacne</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
<i>Metaxestus</i>	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0
<i>Metacerylon</i>	1	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	1
<i>Hypodacnella</i>	1	1	1	0	0	1	1	0	0	0	0	1	1	0	0	0	1	0	1	0
<i>Hypodacne</i>	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
<i>Euxestus</i>	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
<i>Globoeuxestus</i>	1	1	1	1	0	1	0	1	0	0	0	0	0	0	1	1	1	0	1	0
<i>Cycloxenus</i>	1	1	1	1	1	1	0	0	1	0	0	0	0	1	0	1	1	0	1	0
<i>Bradycyclo</i>	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	1	0	×	×	0
<i>Euxestoxenus</i>	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0
<i>Sphaerosoma</i>	1	0	0	0	0	0	0	0	0	0	0	1	0	0	×	0	0	0	1	0
<i>Teredinae</i>	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
<i>Xylariophilus</i>	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

The proposed cladogram is not completely resolved mostly because of lack of larval and reliable adult internal characters from several genera that I was not able to dissect because of little available material. The *Protoxestus* and *Pseudodacne* clades could not be properly placed because of no convincing synapomorphies; the remaining genera share the reduced number of antennomeres (1-3) and obsolete parameres (19) but the last character was not confirmed in *Protoxestus*. Three terminal branches exhibit no apomorphies (*Hypodacne*, *Euxestus* and *Euxestoxenus*). The *Hypodacne* branch can be

supported by larval characters (terga without branched processes, the urogomphi short and unbranched, setae clubbed and stemmata absent) but the polarity of these characters is uncertain and some of the characters are shared with *Euxestus*. *Euxestus* shares the lobed tarsomere (16) with the specialized group including *Globoeuxestus*, *Cycloxenus*, *Bradycycloxenus* and *Euxestoxenus*. In *Pseudodacne* and in two species of *Hypodacnella* the tarsal lobe is very narrow and represents a weak projection rather than the broad and densely setose lobe in the remaining genera; it is probably not homologous. Because of the symmetrical antennal club and no antennal grooves *Euxestus* is immediately separated from the remaining genera with lobed tarsi and seems to form a well defined group. The *Euxestoxenus* node is also not supported by any synapomorphy, mostly because of extreme variability of the species within the genus that are adapted to different habitats. It is possible, however, to consider distinctions between the three genera (*Cycloxenus*, *Euxestoxenus* and *Bradycycloxenus*) as specific adaptations and to unite them into a single genus that would be well defined by the antennae markedly shortened with antennomere III subequal to IV and the following antennomeres often asymmetrical, the club flat and strongly asymmetrical, the prothoracic hypomera concave or with defined cavities. Before uniting these genera the larvae of *Cycloxenus* and *Bradycycloxenus*, as well as more larvae of *Euxestoxenus*, should be described to judge if the marked reduction of the antenna in *Euxestoxenus chappuisi* larva is of specific or higher value. The placement of *Metaxestus* and *Metacerylon* within the euxestine system must await until more data are available, but the monophyly of both these taxa seems to be well established.

An alternative phylogeny of Euxestinae can be proposed basing on a reverse polarity of characters 12 and 13, coding the femoral lines on metasternum and I ventrite as plesiomorphies. Assuming that the ridges on the I abdominal ventrite in *Metacerylon* are of independent origin, the *Hypodacnella* (lines on metasternum and ventrite I) clade would be not be the sister group of *Hypodacne* (lines present on metasternum only), and then of the remaining genera (femoral lines on metasternum absent). This action will not change position of other genera as showed on fig. 30, except that *Protoxestus* and *Pseudodacne* are replaced by *Hypodacnella* and *Hypodacne*. In my opinion both alternatives are equally probable, and the second one seems to be better congruent with the biogeographical data.

(3) MURMIDIINAE

The monophyly of Murmidiinae is supported by at least three synapomorphies: antennal club cylindrical, not at all flattened (fig. 17D), spiculum gastrale absent and ovipositor reduced, without styli. Larval synapomorphies (known only in *Murmidius*) may include the median endocarina that is not found in any group of the cerylonid-group. The systematic position of Murmidiinae is unsettled, since both reduction of the spiculum gastrale and the ovipositor occur also in Discolomidae, and a reduction of the spiculum gastrale has probably occurred many times. In relation to Discolomidae, Murmidiinae could be characterized by three synapomorphies: the hind margin of the last abdominal ventrite crenulate, pronotum always with antennal grooves and larval head with median endocarina. The polarity of the last character is uncertain. Both these groups seems to be closely related and if the characters shared are proved to be synapomorphies Discolomidae should be included in Cerylonidae in the phylogenetic system. So far, Murmidiinae and Cerylonidae are probably sister groups sharing the crenulate ventrite, larvae without urogomphi and stemmata. On this basis the femoral lines on metasternum and ventrite I are postulated to be plesiomorphic in Ceryloninae and Murmidiinae.

Following characters are used to construct a cladogram of Murmidiinae table II.

(1) Antenna 8-9 segmented (10-11-segmented). Eleven segmented antenna occur in Teredinae, Xylariophilinae, several Ceryloninae, and in the more distant Byphyllidae and Byturidae.

(2) Antennomeres IV-VI asymmetrical (symmetrical). This character is developed only in *Mychocerinus*. The antennomeres are

Table II - Character distribution of Murmidiinae genera and Discolomidae and Cerylonidae. (0 = plesiomorphic; 1 = apomorphic; × = not examined or not applicable)

Genus	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Murmidius</i>	0	0	1	1	0	0	0	1	1	0	1	1	1
<i>Mychocerinus</i>	1	1	0	0	0	0	0	0	0	1	1	1	1
<i>Botrodes</i>	1	0	0	0	1	1	1	0	0	0	1	1	1
<i>Discolomidae</i>	0	0	0	0	0	0	1	1	0	1	1	1	0
<i>Ceryloninae</i>	0	0	0	0	0	0	1	0	0	0	0	0	0

sometimes weakly asymmetrical in some Euxestinae with short and compact antenna (*Cycloxemus*, some *Euxestoxemus*) but in *Mychocerinus* there are processes on the inner surfaces that are not homologous with appressed, asymmetrical antennomeres in the Euxestinae.

(3) Clypeus markedly expanded (normal). The strongly expanded clypeus in *Murmidius* is a unique feature absent from other Cerylonidae and related groups. The plesiomorphic clypeus is more or less parallel-sided or weakly expanded apically.

(4) Dorsal antennal cavities on prothorax (ventral). Only known from *Murmidius*. Antennal cavities are found in Euxestinae, Ceryloninae and Eupsilobiinae but they are situated ventrally on the hypomera or on the prosternal sides.

(5) Prosternal process narrowing apically and much narrower than the coxal diameter (parallel-sided and about $2 \times$ as wide as coxal diameter). Developed only in *Botrodoxus*. The procoxal process is variable in Cerylonidae and Bothrideridae.

(6) Mesosternum rounded and prominent anteriorly covering part of the prosternal process (normal, not prominent). Unique for *Botrodoxus* and seems to be correlated with the reduction of the prosternal process. A similar structure is found in most of Eupsilobiinae (Endomychidae) where the mesosternal process is more strongly prominent.

(7) Metasternum with median longitudinal line absent (present). A complete metasternal line is found in the cerylonid-group only in *Murmidius* and *Mychocerinus*; it is largely or totally absent in *Botrodoxus*.

(8) Tegmen with parameres absent (distinct). Only in *Murmidius* the parameres are absent, but they are well developed and apparently articulated in *Botrodoxus* and *Mychocerinus*. The reduction of parameres or the whole tegmen occurred independently several times in Cerylonidae, Endomychidae and in other families of Cucujoidea.

(9) Tibiae angled at outer margins (simple). The simple tibiae appear to be universal for the cerylonid-group, while the apically expanded, angled or spinose tibiae are probably derived structures. The angled tibiae are found in all examined species of *Murmidius*.

(10) Dorsum markedly flattened (convex). The subcortical habitat seems to be a derived state for Cerylonidae, which predominantly live in humus or forest litter. The markedly flattened subcortical forms

are rare in the cerylonid-group, and are found in Ceryloninae in apparently advanced lines, e.g., *Cerylon*, *Philothermopsis*.

(11) Ovipositor without styli (with styli).

(12) Spiculum gastrale absent (present).

(13) Larval head with endocarina (without endocarina).

The last three characters are considered as synapomorphies for the subfamily and were discussed above.

While analysing the distribution of the characters in the out-groups the decision about character polarity within the group has been made judging from the general distribution pattern of the pertinent character. For instance, the antennae in Ceryloninae are 11 or 10 segmented, but sometimes are markedly reduced (6-segmented in some *Axiocerylon*); this is a specific synapomorphy only. The same method was applied in character (8) and (10).

From the character state matrix and the cladogram (fig. 31) it is apparent that the three genera are closely related, and each of them is characterized synapomorphies. The *Mychocerus*+*Botrodes* clade is supported by a single synapomorphy (1-reduced number of antennomeres), but larval characters may provide more convincing synapomorphies for both these genera. Possibly the antennal cavities situated on the ventral side (vs. dorsal in *Murmidius*) may could be regarded as a synapomorphy for this clade, but the polarity of this character is uncertain.

(4) CERYLONINAE

In the absence of convincing synapomorphies no cladogram is given for this large subfamily. The division by my earlier paper (SLIPINSKI 1984) into Lapethini and Cerylonini based on the mesosternal structure, presence of femoral lines and the antennal cavities seems to be artificial after analysing more genera, species and a large number of dissections.

The femoral lines in *Mychocerus*, *Pseudolapethus* or *Lapethinus* seem to be homologous (also with these in Murmidiinae) while I am uncertain about this character in *Axiocerylon* and *Angolon*. They seem to originate as ridges supporting femora and tarsi when retracted and becoming grooves in *Angolon*. The same applies to antennal grooves and cavities in different lines. The very uniform structure of hy-

pomera, the dentate or emarginate epipleuron, coarse punctures on the dorsum and venter and reduced tegmen strongly suggest the monophyly of *Axiocerylon*, *Lawrenciella*, *Thyroderus* and *Angolon*. *Mychocerus*, *Neolapethus* and *Pseudolapethus* from another group defined by the position of the antennal cavities, complete femoral lines and largely reduced but usually present tegmen. On the contrary to a generally accepted polarities, and classifications of the group, I think now that the *Mychocerus* line as defined above is probably the most generalized line in Ceryloninae being closest relative of Murmidiinae. Within this line *Neolapethus* (with 11-segmented antenna, 2-segmented club, complete femoral lines, prosternal plate covering antennal grooves from below) may represent a plesiomorphic taxon. The *Axiocerylon* line, discussed above, is probably an early offshoot from the *Mychocerus* complex, and antennal cavities on hypomeron is the synapomorphy for this group. Both these groups are probably monophyletic and together constitute the major part of my former Lapethini (SLIPINSKI 1984). The relationships between remaining genera and these discussed above are unclear. The genera with the femoral lines on metasternum and antennal grooves on lateral portions of prosternum (*Lapethinus*, *Glomerylon*) may represent intermediate stages. *Philothermus* may be the sister group of remaining genera without cavities on hypomera. Relationships are also discussed below each generic diagnosis.

E) BIOGEOGRAPHY

The Cerylonidae are a small group of mostly tropical and subtropical beetles, with few species in temperate regions. Most of the nontropical species represent the most speciose and heterogeneous genus *Philothermus* and the Holarctic genus *Cerylon* which exclusively occurs under bark of various trees. The cerylonids are found on all continents except Antarctica, all continental and most larger oceanic islands, going up to 4000 m elevation in the Himalayas. Native Cerylonidae are absent from most Atlantic Islands except for Madeira and the West Indies. They are also absent from most mid-Pacific islands except for the subcosmopolitan species *Euxestus erithacus* (Hawaii, Marquesas Isl., Samoa). Most of the larger Pacific islands are inhabited by Cerylonidae, and they occur as far as Society and Cook Islands in SE Polynesia, and Chatham Island in the New

Zealand subregion (sensu GRESSITT 1961). Some of the Pacific islands (Fiji, New Caledonia, New Guinea) have a rich fauna for their size, but the majority of species represent three widely distributed genera *Philothermus*, *Philothermopsis* and *Australiorylon*. More extensive collections using mass sampling methods may extend the known ranges of some litter-inhabiting genera (*Paracerylon*, *Oroussetia* and others).

Table III and the distribution maps (fig. 32-37) summarize the regional distribution of the genera and subfamilies. Euxestinae are widely distributed in all parts of the world with maximum diversity in the Indo-Malayan region (6 genera, 2 endemic) and are almost absent from Europe and Japan (except for the cosmopolitan *Euxestus erithacus*). The presumably most generalized genera occur in Australia-New Zealand (*Hypodacnella*, *Protoxestus*), Holarctic (*Hypodacne*) and Indo-Malaya (*Pseudodacne*). The monotypic subfamily Loebliorylinae is confined to northern India, Himalaya and northern Thailand (5 species in total), while *Ostomopsis* is known from Thailand (one species), Seychelles Islands (one species), New Hebrides, New Caledonia (3 species), and from Mexico and Florida (one species?). Mirmidiinae are predominantly New World inhabitants having only one *Mychocerinus* species on New Caledonia and four native *Mirmidius* species in the Old World, one of them *M. ovalis* is cosmopolitan and often occurs in stored food or other products. The largest subfamily, Ceryloninae, shows uneven distribution with the highest number of genera in Indo-Malaya (19) and India (18), and apparently decreasing towards Australia (5), Africa (12), the Palaearctic (3), Japan (9) and North America north of Mexico (3); it is represented by 12 genera south of Arizona to Chile. The «southern end of the World» is poorly inhabited by Cerylonidae, there are 3 endemic *Philothermus* species on New Zealand closely related to 2 species on Tasmania and southern Victoria, and one, not related, species in Chile. *Hypodacnella* is absent from Chile, one species, widely distributed, is known from Tasmania, one (most plesiomorphic) from New Zealand, one from New Caledonia, and several species widely occur in Queensland and New South Wales in Australia.

Summarizing the distribution patterns of particular groups of Cerylonidae it is evident that the group should be classified as a macrotypal stirps (predominantly warm-climate group) of MURRAY (1870). These beetles fall into CROWSON's (1981) second category that

include taxa with adults usually long-lived but rarely fly on more than two or three occasions in their life and in with larvae not boring in dead timber. Unfortunately little is known about the past history of Cerylonidae. The oldest cerylonid-group fossils are late Cretaceous Siberian amber from the Taymyr Peninsula (Santonian, ca.85 MY BP) and Baltic ambers (Eocene/Oligocene, 37-34 MY BP), the latter includes typical *Cerylon* or a related genus, and are accompanied by Bothriderinae (*Pseudodobothisderes* and *Aeschynoteles*) (S.A. SLIPINSKI, unpublished). Discolomidae, Merophysinae, Alexiidae and other Bothrideridae are missing from Baltic amber. There are several genera of Endomychidae, Coccinellidae, Latridiidae and two specimens of Corylophidae known from Baltic amber, while there is a single representative of putative Endomychidae in the Taymyr amber, but its identity must be confirmed. No representatives of the cerylonid-group are known from Lebanon amber (Neocomian, early Cretaceous), but it includes fossils of Languriidae (*Pharaxonota* or related genus) (CROWSON 1981) that are the mebebrs of Cucujoidea. This, and a relict distribution of several cucujoid families (Nitidulidae, Boganiidae, Sphindidae, Languriidae etc.), seems to prove that Cucujoidea exited before the break-up of Gondwanaland in the upper Cretaceous (ca 100 MY BP), and that Cerylonidae might have existed that time as well. Because of rather poor understanding of phylogeny of the cerylonid-group and of Cerylonidae in particular, it is difficult to construct hypotheses to explain the current distribution of these beetles.

Judging from the Oligocene fossils in Baltic amber, Cerylonidae and Bothrideridae occurring today in the Afrotropical and Indo-Australian regions (*Pseudodobothisderes*, *Aeschynoteles*), were probably widely distributed in Europe, Asia and North America during the warm climate period(s), and became extinct during the climatic changes in the Pleistocene. Two relict species of *Hypodacne* (one in North America, second in Asia) may be remnants of these periods. Since there are several genera represented worldwide and none of the genera (except for *Hypodacnella* and *Hypodacne*?) or subfamilies represents relicts from the past, we can only speculate about the center of origin of Cerylonidae and their dispersal routes.

Distribution of the «relatively generalized» taxa of the particular subfamilies, and more interesting genera is as follow:

Euxestinae: Holarctic: eastern North America, and central Asia

Table III - REGIONAL DISTRIBUTION OF GENERA OF CERYLONIDAE

Abbreviations: PAL - Palaearctic excluding Japan and North Pakistan; JAPAN - Japan including islands up to Taiwan; INDIA - North Pakistan, Himalaya and Continental India including Ceylon; IND-MAL - remaining continental Asia (incl. South China) plus all islands up to New Guinea; PAPUAN - New Guinea and neighbouring islands; AUSTRALIA - Australia and Tasmania; PACIFIC - Seychelles, New Zealand and New Caledonia, plus islands of Melanesia, Polynesia and Micronesia; AFRICA - Africa south of Sahara; MADAG - Madagascar, Comoro and Mascarene Islands; N. AMER - North America north of Mexico; S. AMER - Mexico, West Indies and remaining South America.
 + - indigenous species; ? probably introduced; — - absent.

	PAL	JAPAN	INDIA	IND-MAL	PAPUAN	AUSTRALIA	PACIFIC	AFRICA	MADAG	N.AMER.	S.AMER.
<i>Protonestus</i>	—	—	—	—	—	+	—	—	—	—	—
<i>Pseudodacne</i>	—	—	—	+	—	—	—	—	—	—	—
<i>Hypodacnella</i>	—	—	—	—	—	+	+	—	—	—	—
<i>Hypodacne</i>	+	—	—	—	—	—	—	—	—	+	—
<i>Euxestus</i>	+	?	+	+	+	+	+	+	+	—	?
<i>Euxestoxenus</i>	—	—	+	+	—	—	—	+	—	—	—
<i>Cycloxenus</i>	—	—	+	+	—	—	—	—	—	—	—
<i>Bradycycloxenus</i>	—	—	+	—	—	—	—	—	—	—	—
<i>Globoeuxestus</i>	—	—	—	+	—	—	—	+	—	—	—
<i>Metaxestus</i>	—	—	+	+	+	—	—	+	—	—	—
<i>Metacerylon</i>	—	—	—	—	—	+	—	+	+	—	+
<i>Loebliorylon</i>	—	—	+	+	—	—	—	—	—	—	—
<i>Murmidius</i>	?	?	+	+	?	?	?	+	?	?	+
<i>Mythocerinus</i>	—	—	—	—	—	—	—	—	—	+	+
<i>Botrochus</i>	—	—	—	—	—	—	—	—	—	+	+
<i>Ostonomopsis</i>	—	—	—	+	—	—	+	—	—	?	+
<i>Philothermus</i>	+	+	+	+	+	+	+	+	+	+	+
<i>Ectomierus</i>	—	+	+	+	—	—	—	—	—	—	—
<i>Pakalukia</i>	—	—	—	—	—	—	—	—	—	—	+
<i>Glyptolopus</i>	—	—	—	—	—	—	—	—	—	—	+
<i>Ploecosoma</i>	+	—	—	—	—	—	—	—	—	—	—
<i>Cocclon</i>	—	—	—	+	—	—	—	—	—	—	—

	PAL	JAPAN	INDIA	IND-MAL	PAPUAN	AUSTRALIA	PACIFIC	AFRICA	MADAG	N-AMER.	S-AMER.
<i>Pathelus</i>	—	—	—	—	—	—	+	—	+	—	—
<i>Ellipsorylon</i>	—	—	—	—	—	—	—	+	—	—	—
<i>Acautomus</i> P	—	—	—	—	—	—	—	—	+	—	—
<i>Spinocerylon</i>	—	—	+	+	—	—	—	—	—	—	—
<i>Gyreleon</i>	—	—	—	—	—	—	—	—	—	—	—
<i>Clavicyrion</i>	—	—	—	+	—	—	—	—	—	—	—
<i>Pachylon</i>	—	—	—	+	—	—	—	—	—	—	—
<i>Oreussetia</i>	—	—	—	+	+	—	—	—	—	—	—
<i>Paracerylon</i>	—	+	+	+	—	—	+	—	—	+	—
<i>Cerylon</i>	+	+	—	—	—	—	—	—	—	—	—
<i>Pseudocerylon</i>	—	—	+	+	—	—	—	—	—	—	—
<i>Australorylon</i>	—	—	+	+	+	+	—	—	—	—	—
<i>Orientyrion</i>	—	—	+	+	—	—	—	—	—	—	—
<i>Afroyrion</i>	—	+	+	+	—	+	+	+	+	—	—
<i>Philothermopsis</i>	—	+	+	+	—	—	—	—	—	—	—
<i>Belingia</i>	—	—	—	—	—	—	—	+	—	—	—
<i>Nkolbissonia</i>	—	—	—	—	—	—	—	+	—	—	—
<i>Suakokoia</i>	—	—	—	—	—	—	—	+	—	—	—
<i>Ireus</i>	—	—	—	—	—	—	—	—	—	—	+
<i>Cautomus</i>	—	+	+	+	+	+	+	—	—	—	—
<i>Glomerylon</i>	—	—	+	+	—	—	—	—	—	—	+
<i>Lapethinus</i>	—	—	—	—	—	—	—	—	—	—	+
<i>Rastrolylon</i>	—	—	—	—	—	—	—	—	—	—	+
<i>Neolapethus</i>	—	—	+	—	—	—	—	—	—	—	+
<i>Myhacerus</i>	—	+	?	?	+	+	+	+	—	+	+
<i>Pseudolapethus</i>	—	—	—	—	—	—	—	—	—	—	—
<i>Lawrenciella</i>	—	—	—	—	—	+	—	—	—	—	—
<i>Axiocerylon</i>	—	—	+	+	+	—	+	+	+	—	—
<i>Thyrodurus</i>	—	+	+	+	—	—	—	+	—	—	—
<i>Angolon</i>	—	—	—	—	—	—	—	+	—	—	—
TOTAL	5	9	20	27	11	10	12	16	8	6	13
ENDEMIC	1	0	2	6	0	2	0	5	1	0	6

(*Hypodacne*); Indo-Australian, New Zealand: Philippines to Queensland (*Pseudodacne* and *Protoxestus*); New Zealand, New Caledonia, Australia (*Hypodacnella*).

Metacerylon: the Australian species has the most plesiomorphic (10-segmented) antenna, but it is parallel-sided, and occurs in the tropical forest area that rather precludes its Gondwanian origin. Other species occur in Africa, Madagascar (9-10-segmented antenna) and in Central and South America (7-9-segmented).

Murmidiinae: *Murmidius* is worldwide, while derived genera *Botrodrus* and *Mychocerinus* occur mainly in the New World, with single underscribed species of *Mychocerinus* on New Caledonia.

Ostomopsis is known from the Seychelles Islands, New Caledonia, New Hebrides, Thailand and Florida, Mexico and Panama. The New Caledonian species are much larger, convex and broadly oval compared to the other species. An underscribed species from Thailand is blind and wingless.

Ceryloninae distribution is complex and unclear: *Neolapethus* from Sri Lanka is probably most plesiomorphic member of the *Mychocerus*-line, the Afrotropical members of *Mychocerus* have 10-segmented antenna, the remaining species 8-segmented. *Lawrenciella* (Australia) with 11-segmented antenna is probably plesiomorphic member of the *Axiocerylon*-line, that is extremely variable concerning the antennal segmentation, and posses several specialized cuticular and other structures (see LAWRENCE and HLAVAC 1979). *Philothermus* is worldwide and likely parapyletic in the present constitution; possibly most of cerylonine genera without cavities on hypomera have arisen within that complex.

Two alternative models of the origin of Cerylonidae could be postulated: a) post Cretaceous Asian origin and b) Cretaceous Gondwanan origin; and both these models are equally possible so far. The most parsimonious models congruent with the proposed cladograms must await for complementary studies within the whole cerylonid-group, therefore I will not argue in favour of any conception here to avoid much speculations. Several genera of Ceryloninae (*Ectomicrus*, *Orientrylon*, *Clavicerylon*, *Philothermopsis*, *Afrorylon*) are probably of Asian post-Cretaceous origin (in Oligocene ?). A tropical dispersal route around the northern Pacific (RATCLIFFE 1984, and references cited therein) (Miocene), a dispersal route between North and South America (Pliocene), Africa-Asia migration routes (middle Miocene),

continuous dispersal through islands of the Pacific and others, and the dramatic changes in biotas during the past, would explain their present distributions.

F) CHECK LIST OF SUBFAMILIES AND GENERA OF THE CERYLONIDAE

Subfamily EUXESTINAE

1. *Protoxestus* Sen Gupta et Crowson, 1973: 379.
2. *Pseudodacne* Crotch, 1875: 398.
3. *Hypodacnella* Slipinski, 1988a: 52.
4. *Hypodacne* LeConte, 1875: 170.
Pachyochthes Reitter, 1897: 249.
5. *Euxestus* Wollaston, 1858: 411.
Tritomoidea Motschulsky, 1859: 46.
Neoplotera Belon, 1879: 185.
6. *Euxestoxenus* Arrow, 1925: 155.
Elytrotetrantus John, 1941: 46.
Tachyoryctidium Jeannel et Paulian, 1945: 58.
Anaulokous John, 1963: 324. **Syn. n.**
7. *Cycloxenus* Arrow, 1925: 152.
Xestoxenus Jelinek, 1980: 99. **Syn. n.**
8. *Bradycycloxenus* Arrow, 1926b: 357.
9. *Globoeuxestus* **Gen. n.**
10. *Metaxestus* **Gen. n.**
11. *Metacerylon* Grouvelle, 1906: 110.
Micruloma Carter, 1919: 140. **Syn. n.**
Ceryleuxestus Sen Gupta et Crowson, 1973: 389. **Syn. n.**
Platyxestus Dajoz, 1982: 158.

Subfamily LOEBLIORYLINAE **Subfam. n.**

12. *Loebliorylon* **Gen. n.**

Subfamily MURMIDIINAE

13. *Murmidius* Leach, 1822: 41.
14. *Mychocerinus* **Nom. n.**
Mychocerus LeConte, 1869: 255 nec Erichson, 1845: 293.
15. *Botrodes* Casey, 1890: 320.

Subfamily OSTOMOPSINAE

16. *Ostomopsis* Scott, 1922: 250.

Subfamily CERYLONINAE

17. *Philothermus* Aubé, 1843: 93.
Pseudophilothermus Dajoz, 1973: 154.
Cerylcautomus Sen Gupta et Crowson, 1973: 439. **Syn. n.**
Kenyalon Dajoz, 1974a: 24. **Syn. n.**
Comalon Dajoz, 1974a: 26. **Syn. n.**
Pologlyptus Dajoz, 1974a: 29. **Syn. n.**
Caecodium Dajoz, 1974a: 30. **Syn. n.**
Neoglyptus Dajoz, 1974a: 22. **Syn. n.**
Neoglyptoides Dajoz, 1976a: 258. **Syn. n.**
Batufia Dajoz, 1978: 179. **Syn. n.**
Madacerylon Dajoz, 1980: 246. **Syn. n.**
18. *Ectomicrus* Sharp, 1885a: 78.
Grouvelleia Dajoz, 1975b: 1063.
19. *Pakalukia* **Gen. n.**
20. *Glyptolopus* Erichson, 1845: 292.
21. *Ploeosoma* Wollaston, 1854: 147.
22. *Coccilon* Hinton, 1942a: 152.
23. *Pathelus* Dajoz, 1974a: 27.
Praslinia Dajoz, 1974c: 116. **Syn. n.**
Solumia Dajoz, 1980: 195. **Syn. n.**
As Slipinski, 1982a: 220. **Syn. n.**
Illerylon Slipinski, 1982a: 221.
Praslirylon Nussbaum et Slipinski in Slipinski, 1985a: 615.
Syn. n.
24. *Ellipsorylon* **Gen. n.**
25. *Acautomus* Heinze, 1944a: 31.
26. *Spinocerylon* Slipinski, 1988c: 483.
27. *Gyreleon* Hinton, 1942a: 146.
28. *Clavicerylon* **Gen. n.**
29. *Pachylon* Sharp, 1885a: 79.
30. *Oroussetia* Dajoz, 1981a: 60.
31. *Paracerylon* **Gen. n.**
32. *Cerylon* Latreille, 1802: 205.
Aphardion Gozis, 1886: 11.
33. *Pseudocerylon* Grouvelle, 1897: 389.
34. *Australiorylon* Slipinski, 1988a: 15.
35. *Orientrylon* **Gen. n.**
36. *Afrorylon* Slipinski, 1980a: 469. **Stat. n.**

37. *Philothermopsis* Heinze, 1944a: 30.
 Cerylonopsis Heinze, 1944a: 29. **Syn. n.**
 Enolozwaia Dajoz, 1978: 185. **Syn. n.**
 Manengouba Dajoz, 1978: 188. **Syn. n.**
38. *Beliugaia* Dajoz, 1974b: 290.
39. *Nkolbissonia* Dajoz, 1978: 179.
40. *Suakokoia* Sen Gupta et Crowson, 1973: 179.
 Ahalaia Dajoz, 1978: 181. **Syn. n.**
41. *Ivies* **Gen. n.**
42. *Cautomus* Sharp, 1885a: 82.
 Aculagnathus Oke, 1932: 22.
 Paracautomus Heinze, 1944a: 31.
 Leptoxyscheilus Besuchet, 1972: 127. **Syn. n.**
43. *Glomerylon* **Gen. n.**
44. *Lapethinus* Slipinski, 1984: 89.
45. *Rostrorylon* **Gen. n.**
46. *Neolapethus* Sen Gupta et Pal, 1985: 27.
47. *Myhocerus* Erichson, 1845: 292.
 Lapethus Casey, 1890: 317. **Syn. n.**
 Lytopeplus Sharp, 1895: 494.
 Brachylon Gorham, 1898: 256.
 Lapecautomus Sen Gupta et Crowson, 1973: 409.
 Decalapethus Dajoz, 1978: 207.
48. *Pseudolapethus* Slipinski, 1984: 98.
49. *Lawrenciella* **Nom. n.** *Lawrenciella* Slipinski, 1988a: 44 nec Strand, 1932: 142.
50. *Axiocerylon* Grouvelle, 1918: 41.
 Paraxiocerylon Heinze, 1944d: 21.
 Decaxiocerylon Dajoz, 1978: 207.
51. *Thyroderus* Sharp, 1885a: 82.
 Dolosus Dajoz, 1963: 91.
52. *Angolon* Dajoz, 1977a: 92.

IV. TAXONOMY

A) KEY TO THE SUBFAMILIES

A D U L T S

1. Fronto-clypeal suture absent; maxillary palps distinctly aciculate (fig. 2A) with apical palpomere shorter and much narrower than penultimate segment 2
- Fronto-clypeal suture present (fig. 77C); maxillary palps not aciculate (fig. 65 F) with apical palpomere longer and not narrower than the penultimate segment 3
2. Last abdominal ventrite with hind edge inflexed and crenulated (fig. 16E); tegmen of aedeagus asymmetrical and without ventral strut CERYLONINAE (p. 89)
- Last abdominal ventrite with inflexed edge, smooth, not crenulated (fig. 18B); tegmen of aedeagus symmetrical and with long articulated ventral strut (fig. 76A) LOEBLIORYLINAE (p. 81)
3. Number of abdominal spiracles 7; ventrite V with exposed edge smooth; procoxal cavities always closed externally and prosternal process expanded apically (fig. 64A); wing with jugal lobe and at least with single anal vein (fig. 63E) EUXESTINAE (p. 64)
- Number of abdominal spiracles 5; ventrite V with hind edge exposed and inflexed, crenulated; procoxal cavities open externally and prosternal process usually parallel-sided; wing without jugal lobe and anal veins (fig. 6B,C) 4
4. Metasternum and ventrite I with femoral lines (fig. 78D); head with transverse occipital ridge (fig. 77C); tarsi 4-4-4; prothorx always with antennal cavities situated at front angles; pronotal sides smooth; wing with divided subcubital fleck (fig. 6B); dorsum smooth or with short appressed setae MURMIDIINAE (p. 83)
- Metasternum and ventrite I without femoral lines (fig. 80E); head without transverse occipital ridge; prothorax without antennal cavities; pronotal sides crenulate (fig. 80D); wing without subcubital fleck (fig. 6C); dorsum densely setose OSTOMIOPSINAE (p. 88)

L A R V A E

1. Body slightly onisciform (fig. 24); stemmata and urogomphi absent; mandibles and maxillae stylet-like, either endognathous (fig. 27D) or enclosed within tubular piercing beak (fig. 25A) CERYLONINAE
- Body different; mandibles always with asperate mola of normal chewing-type 2
2. Body elongate (fig. 19A) often with lateral branched processes; urogomphi long and diverging; hypostomal rods and median endocarina absent (fig. 19F); mandible with basal asperate mola and no prostheca (fig. 21C); spiracles often situated on short processes (fig. 19D) EUXESTINAE
- Body broadly oval, flattened and disk-like (fig. 22A); stemmata and urogomphi absent; median endocarina well developed (fig. 23B); mandible with basal asperate mola and hyaline prostheca (fig. 23A); vestiture includes barbed setae MURMIDIINAE

KEY TO KNOWN GENERA OF LARVAL EUXESTINAE

1. Antenna strongly reduced, 1-segmented, cone-shaped
..... (*chappuisi*) *Euxestoxenus*
- Antenna normal, 3-segmented 2
2. Thoracic and abdominal terga with branched processes (fig. 19A). Number of stemmata 2. Spiracles distinctly annular-biforous, situated on processes (fig. 19D, E). Mandibles tridentate apically *Hypodacnella*
- Thoracic and abdominal terga without branched processes (fig. 21A). Number of stemmata 0. Spiracles apparently annular, only slightly prominent. Mandibles bidentate apically 3
3. Mandible without brush of setae at molar base. Thoracic and abdominal terga weakly expanded laterally *Hypodacne*
- Mandible with brush of setae at molar base (fig. 21C). Thoracic and abdominal terga not expanded laterally . *Euxestus*

B) SUBFAMILY EUXESTINAE

Euxestinae Grouvelle, 1908: 452.

Pachyochthesinae Reitter, 1911: 105.

Metacerylini Heinze, 1944a: 19.

Cycloxenini Jeannel et Paulian, 1945: 57.

Tachyoryctidiini Jeannel et Paulian, 1945: 56.

DIAGNOSTIC COMBINATIONS

A D U L T

Body variable, subcylindrical (fig. 40) to broadly-oval (fig. 38, 39) and convex, rarely flattened; winged; dorsum glabrous or setose. Head with fronto-clypeal suture. Antenna 7-11 segmented with large, flattened club composed of 1-3 segments (fig. 63B, C, 66C, 68B). Mouthparts. Labrum transverse with short, apically widened labral rods; mesal arms of tormae not clearly joined to outer arms and projecting mesally. Mandible tridentate apically (fig. 69G), prostheca wide, densely setose, often with 1 or 2 apical sclerotized spines (fig. 71E); molar part well-developed and transversely ridged. Last maxillary palpomere subulate (fig. 65E), much longer and usually as wide as the penultimate segment; galea and lacinia wide, densely hairy apically, lacinia often with apical spine. Ligula weakly expanded apically, prementum setose (fig. 68D). Prothorax with or without antennal cavities; prosternal process always expanded apically and procoxal cavities externally closed, internally open or almost closed. Metasternum and ventrite I often with femoral lines. Wing (fig. 63E, 65D, 71A) with jugal lobe and 1-3 anal veins; subcubital fleck and anal cell often present. Abdomen with 7 pairs of spiracles; ventrites with or without lateral expansions (fig. 64D, 69B, 72A, B). Aedeagus: median lobe much longer than abdomen, weakly sclerotized and laminate; tegmen with anterior tegminal lobe lying above the median lobe (fig. 67C); parameres usually reduced to obsolete. Ovipositor (fig. 70H) short, with long styli; spiculum gastrale absent.

L A R V A (fig. 19-21).

Body elongate, moderately convex; abdominal terga 1-8 with branched lateral processes or with dorsal and lateral processes; urogomphi long, diverging, more-or-less straight. Head without

median endocarina; stemmata 0-2 on each side; mouthparts of chewing type; hypostomal rods usually absent; mandible with basal, asperate mola and without prostheca; maxillary mala obtuse apically, often with apical spine; maxillary articulating area present. Antenna moderately long, about 0.2-0.3 x as wide as head with three distinct segments and moderately long sensorium on antennomere II, (only in *Euxestoxenus chappuisi* antenna reduced to one-segmented cone). Spiracles annular or annular-biforous, often placed at the ends of short tubular processes.

KEY TO GENERA OF EUXESTINAE

1. Antennal club 3-segmented, antenna 11-segmented (fig. 63C); tarsomere I simple (fig. 63D); metasternum and ventrite I without femoral lines; wing with subcubital fleck *Protoxestus* (p. 67)
- Antennal club 1-2 segmented. No other characters in combination 2
2. Antenna 11-segmented with broad 2-segmented club (fig. 66C) *Pseudodacne* (p. 68)
- Antenna never 11-segmented 3
3. Tarsomere I lobed below, the lobe reaching behind tarsomere III (fig. 68I) 4
- Tarsomere I simple or very rarely obliquely projecting below but not reaching behind tarsomere II (fig. 64E) 8
4. Anterior margin of prosternum forms a continuous line without any trace of emarginations laterally to receive antenna (fig. 66A); hypomera weakly concave; wing with subcubital fleck; antenna 9-10 segmented with 1-segmented club (fig. 67A,D) *Euxestus* (p. 72)
- Anterior margin of prosternum emarginate laterally to receive antennal funicle (fig. 63B); hypomera concave with or without antennal cavities. No other characters in combination 5
5. Hind angles of pronotum produced backwards over humeri of elytra (fig. 63A); antenna 9-segmented; elytra almost smooth and shiny *Bradycycloxenus* (p. 76)
- Hind angles of pronotum not produced over shoulders of elytra. No other characters in combination 6

6. Antenna 10-segmented, club relatively small and weakly asymmetrical (fig. 71G); antennomere III several times longer than IV; wing without subcubital fleck; prosternum weakly carinate anteromedially (fig. 71C) *Globoexestus* (p. 77)
- Antenna 9-10 segmented with club very large and markedly asymmetrical (fig. 68B, 69D); antennomere III as long or slightly longer than IV; wing with subcubital fleck; prosternum not carinate 7
7. Prosternal process narrower than coxa (fig. 68A); dorsum densely and coarsely punctate and setose; punctures almost contiguous, and elytral ones not arranged in regular rows; antenna 8- or 9-segmented (fig. 68B); antennal cavities on hypomera barely visible *Cycloxenus* (p. 75)
- Prosternal process much wider than coxa (fig. 69A); dorsum usually sparsely punctate and setose, often almost smooth; elytra smooth or with punctures in regular rows; antenna 9- or 10-segmented; antennal cavities on hypomera variable, usually more-or-less defined posteriorly (fig. 16A) *Euxestoxenus* (p. 73)
8. Prosternum with admedian lines (fig. 64A); anterior margin of prosternum emarginate laterally, forming grooves to receive antennae; metasternum and ventrite I with femoral lines (fig. 64D); wing with subcubital fleck *Hypodacnella* (p. 69)
- Prosternum never with admedian lines; anterior margin of prosternum entire, continuing laterally to meet anterior angles, not forming antennal grooves; femoral lines usually on ventrite I only; wing with or without subcubital fleck 9
9. Ventrite I with femoral lines (fig. 72A,B); ventrites III and/or IV with lateral expansions; wing without subcubital fleck *Metacerylon* (p. 79)
- Ventrite I without femoral lines; ventrites without lateral expansions; wing with subcubital fleck 10
10. Body broadly-oval; metasternum with vestigial femoral lines; all coxae widely separated; aedeagus with median lobe weakly sclerotized and laminate *Hypodacne* (p. 70)
- Body narrow, almost parallel-sided; metasternum without femoral lines; all coxae narrowly separated; aedeagus heavily sclerotized and spiral (fig. 66F) *Metaxestus* (p. 78)

Protoxestus Sen Gupta and Crowson

Protoxestus Sen Gupta and Crowson, 1973: 379. Type species, by original designation: *Protoxestus australicus* Sen Gupta and Crowson, 1973. - Slipinski 1988a: 70.

Diagnostic combination - Length 2.8 mm; broadly-oval; convex; winged; dorsum glabrous. **HEAD**: antenna 11-segmented with well-defined 3-segmented club (fig. 63C), antennomere III as long as three following segments combined; antennal groove on ventral side of head long, reaching behind eyes; mouthparts as in *Hypodacnella*. **PROTHORAX** without antennal grooves and cavities; admedian lines absent; prosternal process about as wide as coxa; procoxal cavities closed externally; metasternum and ventrite I without femoral lines, ventrites without lateral expansions. **LEGS**: tibiae slender; tarsi 4-4-4, tarsomeres simple (fig. 63D), empodium present. **ELYTRA** convex, irregularly punctured; epipleura wide, complete. **WING**: with 2 anal veins and 2 anal cells (fig. 63E), 1st anal vein running into divided subcubital fleck. Aedeagus and ovipositor not studied.

Immature stages - Unknown.

Biology - The two known specimens of this genus were collected from decayed plank buttresses of dead *Laportea gigas*.

Distribution - Australia: Queensland.

Species included - *P. australicus* Sen Gupta et Crowson.

Discussion - This genus was supposed by Sen Gupta and Crowson to be the most primitive member of Euxestinae and even of the entire family Cerylonidae because of its 11-segmented antenna with completely divided 3-segmented club. It differs from similar genera, *Hypodacne* and *Hypodacnella*, in having a 3-segmented antennal club (although in *H. rubripes* the club is apparently 3-segmented) and in lacking prosternal lines and femoral lines on metasternum and first ventrite. It shares the lack of femoral lines with *Pseudodacne* but is easily distinguished in having 3-segmented, instead of 2-segmented, antennal club and the first tarsomere simple, not lobed below.

This genus presents an interesting combination of characters that could be variously interpreted: wing with 2 closed a-cells, simple tarsomere, 11-segmented antenna with 3-segmented club, and simple abdominal ventrites are probably plesiomorphic in relation to other Euxestinae. Judging from the aedeagal structure and the form of the

antennae, *Pseudodacne* also seems to represent a generalized line of Euxestinae (tegmen with well developed and setose parameres, antennal club 2-segmented), although it has lobed tarsomere I and no femoral lines.

Pseudodacne Crotch

Pseudodacne Crotch, 1875: 398. Type species, by original designation, *Pseudodacne admirabilis* Crotch, 1875.

— Emden 1928: 71; Sen Gupta and Crowson 1973: 382.

Diagnostic combination - Length 2.5-3.4 mm; broadly-oval; moderately convex; winged; dorsum glabrous and shiny. **HEAD**: eyes coarsely faceted and situated more ventrally than in other genera; antenna 11-segmented with 2-segmented club (fig. 66C); antennomere III about $3 \times$ as long as IV; antennal grooves on ventral side deep and reaching behind eyes; mouthparts similar to *Euxestus*. **PROTHORAX** narrowly margined laterally; hypomera concave but without antennal cavities; anterior margin of prosternum weakly prominent medially (fig. 66A), not emarginate laterally to receive antenna; prosternal process almost as wide as coxa, expanded apically; procoxal cavities externally closed. Mesosternal process about $1.2 \times$ as wide as coxa; metasternum and ventrite I without femoral lines; ventrites without lateral expansions. **LEGS** comparatively long; tibiae slender (fig. 66D); tarsi with tarsomere I narrowly lobed below; empodium present. **ELYTRA** almost smooth, micropunctured, often with reddish patches on dark background; epipleura narrowing apically but complete. **WING** as in *Euxestus*. **AEDEAGUS** with median lobe sclerotized bearing subapical internal tooth; tegmen with parameres well separated, setose. Ovipositor not examined. No external differences between sexes.

Immature stages - Unknown.

Biology - One specimens was extracted from forest litter.

Distribution - Indonesia (Sumatra), Malaysia (Sabah, Sarawak); Philippine Islands (Mindanao, Luzon).

Species included - *P. admirabilis* Crotch.

Discussion - This monotypic genus is well characterized by the antennal club being distinctly 2-segmented, the femoral lines absent, and the prosternum without antennal grooves or cavities. The

median lobe in *Pseudodacne* is well sclerotized and the tegmen bears distinct, setose parameres that is unique in the subfamily. Its systematic position is unclear, and is discussed under *Protoxestus* (p. 67).

Hypodacnella Slipinski

Hypodacnella Slipinski, 1988a: 52. Type species, by original designation, *Euxestus bivulneratus* Lea, 1921.

Diagnostic combination - Length 1.8-3.0 mm; broadly-oval (fig. 38); convex; winged; dorsum glabrous or sparsely microsetose. **HEAD**: antenna 10-segmented with 1-segmented club (fig. 64B), exceptionally (*H. rubripes*) antennomere IX strongly dilated forming an apparent segment of the club; mouthparts typical for the subfamily. **PROTHORAX** with hypomera concave but without delimited cavities; anterior margin of prosternum emarginate laterally forming weak antennal grooves to receive antennal club (fig. 64A), the funicle is spirally rolled in a groove by lower margin of eye; prosternum with additional pair of admedian lines; prosternal process about 3-4 × as wide as coxa, widened apically; procoxal cavities externally closed; meso- and metacoxae widely separated; metasternum and ventrite I with femoral lines (fig. 64D); ventrite IV with weak lateral expansions. **LEGS**: tibia slender; tarsi 4-4-4; tarsomere I simple, rarely obliquely projecting below but not reaching behind tarsomere II (fig. 64E); empodium present. **ELYTRA** variable, irregularly or regularly striate, glabrous or sparsely microsetose; epipleura complete with weak impression to receive lobes of ventrite IV. **WING** very similar to *Protoxestus*. **AEDEAGUS** (fig. 64C, F, G): with asymmetrical anterior tegminal lobe lying above the median lobe which lacks struts; median lobe long, weakly sclerotized and laminate. Ovipositor as in fig. 10D. No external differences between sexes.

Immature stages - A supposed larva of *H. bivulnerata* was described by Sen Gupta and Crowson (1973: 381); see also p. 32.

Biology - Adults of most species were extracted from logs and bark, and from rain-forest litter; the supposed larvae of *H. bivulnerata* were collected in leaf litter and from decayed wood from the base of a fallen tree.

Distribution - New Caledonia, New Zealand and Australia.

Species included - *H. atropolita* (Lea); *H. atra* (Lea); *H. bivulnerata* (Lea); *H. euxestoides* Slipinski; *H. kasiae* Slipinski; *H. medionigra* (Lea); *H. rubripes* (Reitter); *H. sebastiani* Slipinski; *H. tasmaniae* (Lea); *H. ventralis* (Lea); *H. vulnerata* (Lea).

Discussion - The prosternal admedian lines are unique for this genus and are interpreted here as apomorphic. The New Zealand species *H. rubripes* represents the most plesiomorphic conditions for antennal and wing structures in having antenna 10-segmented with apical clearly consisting of 2 incompletely fused and the preceding one transverse, so the club appears almost 3-segmented. This genus differs from the Holarctic genus *Hypodacne* in having the prosternal lines, femoral lines on the metasternum and first abdominal ventrite, and ventrite IV with weak lateral expansions. The described larvae of *Hypodacne* and *Hypodacnella* differ considerably by presence of the branched lateral processes on all terga of the latter.

Hypodacne LeConte

Hypodacne LeConte, 1875: 170. Type species, by monotypy, *Hypodacne punctata* LeConte, 1875.

Euxestus: auct.

Pachyochthes Reitter, 1897: 249. Type species, by monotypy, *Pachyochthes edithae* Reitter, 1897. - Synonymized by Nikitsky and Belov 1978: 851.

— Sen Gupta and Crowson 1973: 380; Lawrence and Stephan 1975: 138; Nikitsky and Belov 1979: 851; Nikitsky 1988.

Diagnostic combination - Length 2.3-3.2 mm; elongate-oval; moderately convex; winged; dorsum apparently glabrous. HEAD with antennal grooves on ventral side curved and reaching far behind eyes; antenna 10-segmented with 1 or 2-segmented club, (fig. 65A, B); mouthparts typical for the subfamily, as in fig. 65E, F. PROTHORAX without antennal grooves or cavities; hypomera weakly concave; prosternal process about as wide as coxa, expanded apically; procoxal cavities externally closed; prosternum without admedian lines. Metasternum with femoral lines vestigial and close to coxal cavities (fig. 65C); ventrite I without femoral lines; ventrite IV without lateral expansions. LEGS: tibiae widened apically; tarsi 4-4-4, tarsomeres simple; empodium present. ELYTRA with irregular rows of punctures; epipleura narrow and complete. WING with subcubital fleck and 2 or 3 anal veins (fig. 65D). AEDEAGUS with median lobe extremely long, weakly sclerotized and laminate; anterior tegminal lobe dorsal;

paramers reduced. Ovipositor as in *Hypodacnella*. No external differences between sexes.

Immature stages - The mature larva of *H. edithae* was described by NIKITSKY and BELOV (1979: 852). According to the original description and included illustrations the larva of *H. edithae* is extremely similar to a supposed larva of *Euxestus erithacus* (p. 32) and the only possible differences are the lack of basal molar brush of the setae and more expanded laterally tergites of the former. The authors did not give description of hypopharynx, number of stemmata (probably absent) and epipharynx.

Biology - According to LAWRENCE and STEPHAN (1975) specimens of *H. punctata* were observed in galleries of carpenter ants (*Camponotus* sp.) crawling among ants on wall of galleries in oak, elm and beech. Specimens of *H. edithae* were collected under decaying bark of *Salix caprea*, in rotten wood and bark of beech, and under wood pieces on a sea beach.

Distribution - Asia (USSR: Talysh; Iran); North America (from southern Ontario to Florida, and west to Kansas and Texas).

Species included - *H. edithae* (Reitter); *H. punctata* LeConte.

Discussion - Like *Hypodacnella*, *Metacerylon*, *Metaxestus* and *Protoxestus*, but unlike other Euxestinae, the first tarsomere in *Hypodacne* is simple, not lobed below. It can easily be distinguished from *Metacerylon* by the lack of femoral lines on the first abdominal ventrite, compact and strongly convex body and the subcubital fleck on the wing. Unlike *Hypodacnella*, the prosternal admedian lines, the femoral lines on the first abdominal ventrite are lacking, and the ventrites do not have lateral expansions in *Hypodacne*. It can be distinguished from *Metaxestus* by its broadly-oval and convex body (narrow and almost parallel-sided in *Metaxestus*), the presence of reduced femoral lines on the metasternum and by the weakly sclerotized, laminate median lobe.

I disagree with the recent action of NIKITSKY (1988) who argued that *Pachyochthes* should be given a separate generic status, in my opinion *H. edithae* is a plesiomorphic member of the genus *Hypodacne*.

Euxestus Wollaston

Euxestus Wollaston, 1858: 411. Type species, by monotypy, *Euxestus parki* Wollaston, 1858.

Tritomidea Motschulsky, 1859: 104. Type species, by original designation, *Tritomidea* [sic!] *translucida* Motschulsky, 1859. - Synonymized by Reitter 1882: 199.

Neoplotera Belon, 1879: 185. Type species, by monotypy, *Neoplotera peregrina* Belon, 1879. - Synonymized by Reitter 1882: 199.

— Arrow 1922; Emden 1928: 84-110; Sen Gupta and Crowson 1973: 382.

Diagnostic combination - Length 1.8-3.1 mm; elongate to broadly-oval (fig. 67A); convex; winged; dorsum usually glabrous. **HEAD**: antennal grooves on ventral side short and not reaching behind eyes; antenna 9 or 10-segmented with 1-segmented club; mouthparts as in *Hypodacnella*. **PROTHORAX** without antennal cavities, anterior margin of prosternum not emarginate laterally to from antennal groove; posternal process about as wide as coxa, widened apically; procoxal cavities externally closed. Metasternum and ventrite I without femoral lines, ventrites without expansions. **LEGS** variable, usually tibia narrow and weakly expanded apically; tarsomere I always lobed below (fig. 67E); empodium present. **ELYTRA** smooth or finely punctate, punctures usually in regular rows; epipleura narrow, complete. **WING** as in fig. 67B, always with two anal veins, single anal cell and subcubital fleck. **AEDEAGUS** (fig. 67C, F) with median lobe moderately elongate, weakly sclerotized and laminate; tegmen anterior lobe lying above the median lobe, parameres reduced. Ovipositor similar to *Hypodacnella*. No external deferences between sexes.

Immature stages - A supposed larva of *E. phalacroides* was briefly described by SEN GUPTA and CROWSON (1973: 383). A supposed larva of a widely distributed *E. erithacus* (see p. 32) and an unassociated larva from Australia (Queensland) agree with the description mentioned above, and all differ from *Hypodacnella* having thoracic and abdominal terga without branched processes and only weakly expanded laterally; the mandible bidentate apically; dorsal setae at least partly clubbed apically; stemmata absent, and the spiracles less distinctly annular-biforous type, not situated on distinct processes. See also *Hypodacne* for discussion.

Biology - *E. erithacus* and an underscribed species from Fiji were found in numbers breeding in bat guano in caves; most of the specimens were extracted from forest and log litter; *E. fungorum* has

been reported from fungal fruiting bodies (*Xylaria anisopleura*, *Rigodoporus zonalis*, unnamed Agaricales).

Distribution - *E. erithacus* is widely distributed in all warmer parts of the World including New World (from Cuba to Brazil) and Mediterranean Region (Madeira, southern France, Spain) as well. Most of the known species are geographically restricted and fairly abundant in the Indo-Australian region, one is endemic to Madeira and *E. phalacroides* occurs in the eastern Africa, South Africa, Madagascar, Comoro, Mascarene and Seychelle Islands.

Species included - *E. aneipennis* Fauvel; *E. analis* Arrow; *E. arrowi* Emden; *E. basilianicus* Emden; *E. celebensis* Emden; *E. elongatus* Slipinski; *E. erithacus* (Chevrolat); *E. fungorum* Slipinski; *E. globolus* Arrow; *E. hypomelas* Arrow; *E. luzonicus* Emden; *E. papuanus* Slipinski; *E. parki* Wollaston; *E. phalacroides* Wollaston; *E. translucidus* (Motschulsky).

Discussion - This genus shares with most of Euxestinae tarsomere I lobed below and reaching at least to apex of tarsomere III. Unlike *Pseudodacne*, it has the antennal club 1-segmented and more-or-less symmetrical. It can be distinguished from all the remaining genera with lobed tarsomere I by the form of the prosternus, that anteriorly is not emarginate to receive antenna. The body shape of *Euxestus* is extremely similar to that of *Globoeuxestus*, and both these genera can easily be confused without examination of the ventral side and wings. *Globoeuxestus* has the prosternum emarginate laterally (fig. 71C) and at least weakly carinate anteromedially, the antennal club distinctly asymmetrical and the wing without a sub-cubital fleck; also the body is more compact and more strongly convex in *Globoeuxestus*.

Euxestoxenus Arrow

Euxestoxenus Arrow, 1925: 155. Type species, by original designation, *Euxestoxenus striatus* Arrow, 1925.

Elytrotetrantus John, 1941: 46. Type species, by original designation, *Elytrotetrantus cardatus* John, 1941. - Synonymized by John 1968: 53.

Tachyoryctidium Jeannel and Paulian, 1945: 58. Type species, by original designation, *Tachyoryctidium chappuisi* Jeannel and Paulian, 1945. - Synonymized by John 1968: 54.

Anaulakous John, 1963: 324. Type species, by original designation, *Elytrotetrantus myrmecophilus* John, 1963 [subgenus]. **Syn.n.**

— Arrow 1937; John 1954, 1958, 1963, 1964, 1967; Sen Gupta and Crowson 1973: 383, 385; Dajoz 1976b: 186.

Diagnostic combination - Length 1.8-3.6 mm; broadly-oval (fig. 39); convex; winged; dorsum usually setose. **HEAD**: antenna 9-10 segmented, with large, flattened club (fig. 69D); antennal grooves on ventral side deep and reaching far behind eyes (fig. 69F); mouthparts typical for the subfamily (fig. 69E, G). **PROTHORAX**: hypomera concave with antennal cavities poorly impressed posteriorly (fig. 69A); prosternal process 2-3 \times as wide as coxa, slightly expanded apically; procoxal cavities narrowly closed externally. Mesosternal process about twice as wide as coxa; metasternum and ventrite I without femoral lines; ventrites usually without expansions. **LEGS**: flattened, tibiae variable, usually widened apically; tarsomere I lobed below (fig. 69C). **ELYTRA** usually with 9 rows of stria punctures. rows sometimes reduced or absent; epipleura wide, complete. **AEDEAGUS** with long and laminate, weakly sclerotized median lobe; tegmen with asymmetrical anterior lobe lying above median lobe; parameres reduced. Ovipositor as in fig. 10D. No external differences between sexes.

Immature stages - The only known larva of the genus is that of *E. chappuisi* described by Jeannel and PAULIAN (1945: 186) and redescribed by DAJOZ (1976b: 186). It is very distinctive because of strongly reduced antenna that forms 1-segmented, not apically setose cone; the mandible is bidentate apically with strongly developed and asperate mola, without basal brush of setae; the thoracic and abdominal terga are weakly expanded laterally, the abdominal ones more strongly than the thoracic ones, dorsally covered by spine-like asperities; the tergal setae are long and pointed apically; abdominal tergum 9 bearing stout, weakly converging, densely setose urogomphi, that are as long as last four abdominal terga combined. The remaining structures are very similar to those of *Euxestus*.

Biology - Species of this genus have been found in nests of ants, in fungus gardens of termites (*Odontotermes obesus*, *Odontotermes* sp., and nests of mole-rats (*Tachyoryctes* sp.); but most of the specimens have been found in forest litter, grass piles and rarely in stored products of man. African specimens were also collected in light traps.

Distribution - Oriental: India (Kumaon), Thailand (Doi Inthanon); Afrotropical: widely distributed in most of the countries south of the Sahara.

Species included - *E. cardatus* (John); *E. chappuisi* (Jeannele and Paulian); *E. decellei* (John); *E. myrmecophilus* (John); *E. praecipuus* (John); *E. rotundus* Arrow; *E. striatus* Arrow; *E. sulphureus* Dajoz; *E. thoracicus* Dajoz.

Discussion - This is the largest genus of the subfamily with about 60 existing names mostly by H. John, and the recent examination of his types proved that about 70 per cent of them have to be synonymized either with Arrow's earlier names or those proposed by John. *Euxestoxenus* is very similar to *Cycloxenus* in having large, flattened and markedly asymmetrical antennal club, antennomere III very short, dorsum often shortly setose and the wing with subcubital fleck. The subcubital fleck is shared with other genera and is symplesiomorphy for Euxestinae and Murmidiinae, while the strongly asymmetrical antennal club and short antennomere III are synapomorphies for both these genera and *Bradycycloxenus*. Possibly all should constitute a single genus. The antennal cavities on hypomera at least weakly delimited and separated procoxae seem to constitute characters (apomorphies) uniting the species of *Euxestoxenus*.

Cycloxenus Arrow

Cycloxenus Arrow, 1925: 152. Type species, by original designation, *Cycloxenus hispidus* Arrow, 1925.

Xestoxenus Jelinek, 1980: 99. Type species, by original designation, *Pocadius indicus* Motschulsky, 1858. **Syn.n.** - SEN GUPTA and CROWSON 1973: 383.

Diagnostic combination - Length 2.0-3.8 mm; broadly-oval; convex; winged; dorsum densely setose. HEAD: eyes large; antenna 8 or 9-segmented with large, flattened 1-segmented club (fig. 68B); antennal grooves on ventral side long and reaching far behind eyes; mouthparts as in fig. 68C, D. PROTHORAX: dorsum strongly convex, densely and coarsely punctured, margins unbordered; hypomera concave but without defined antennal cavities (fig. 68A); prosternal process narrow and markedly expanded apically; procoxal cavities externally closed. Mesosternal process about $0.5 \times$ as wide as coxa (fig. 68E); metasternum and ventrite I without femoral lines; ventrites III and IV with lateral expansions (fig. 68F). LEGS short, femora and tibia flattened; tarsomere I lobed below (fig. 68I); empodium present. ELYTRA irregularly but coarsely punctured; epipleura wide, complete. AEDEAGUS (fig. 68G-H) with median lobe moderately strongly sclerotized, laminate; tegmen as in *Euxestus*.

Ovipositor as in *Euxestoxenus*, spermatheca as in fig. 10C. No external differences between sexes.

Immature stages - Unknown.

Biology - *C. hispidus* was recorded from nests of fungus-eating termites, while an underscribed species from Nepal was collected in leaf litter. An additional species from Malaysia was collected in *Odontotermes* nests by D. Kistner.

Distribution - India (Kumaon); Nepal; Malayan Peninsula.

Species included - *C. hispidus* Arrow, *C. indicus* (Motschulsky).

Discussion - According to the original description and illustrations of *Xestoxenus* the only differences between *Cycloxenus hispidus* and this genus are the narrower prosternal process and the 8-segmented antenna. Jelinek did not mention the expanded ventrites, but it could be easily overlooked on a dry preserved specimen. The prosternal process in *C. indicus* is expanded apically and the tarsi are 4-segmented, not 5-segmented as reported by Jelinek (N.B. NIKITSKY, personal communication).

Bradycycloxenus Arrow

Bradycycloxenus Arrow, 1926b: 357. Type species, by monotypy, *Bradycycloxenus lobicollis* Arrow, 1926b. - Sen Gupta and Crowson 1973: 386.

Diagnostic combination - Length 2.8 mm; oval; convex; winged; dorsum very sparsely, shortly setose. HEAD: antennal grooves long and reaching far behind eyes (fig. 63B); antenna 9-segmented with large 1-segmented club, antennomere III only slightly longer than IV; mouthparts apparently similar to *Cycloxenus*, but not dissected. PROTHORAX with hind angles produced backwards as lobes over humeri of elytra (fig. 63A); anterior largin of prosternum emarginate laterally to receive antenna; hypomera concave with weakly defined antennal cavities; prosternal process about as wide as coxa, expanded apically; coxal cavities externally closed; metasternum and ventrite I without femoral lines; ventrites without lateral expansions. ELYTRA irregularly micropunctured, sparsely setose; epipleura complete, gradually narrowing apically. LEGS: tarsi with tarsomere I lobed below, the lobe reaching beyond middle of segment IV; empodium absent ?. Wings, aedeagus and ovipositor not examined.

Immature stages - Unknown.

Biology - The only known specimen of this genus was found under dry leaves on moist sand.

Distribution - India: Kumaon (Haldwani Distr.).

Species included - *B. lobicollis* Arrow.

Discussion - This genus, unlike other genera of Euxestinae, has the hind pronotal angles strongly produced backwards to form lobes over humeri of elytra (fig. 63A). The form of hind angles of prothorax, the reduced number of antennomeres and the elytra lacking the striae of punctures are all apomorphies with relation to other euxestine genera. The notable similarity in form of the prothoracic hind angles occurs in an underscribed genus of eupsilobiine Endomychidae (J. PAKALUK and S.A. SLIPINSKI, in preparation).

Globoeuxestus gen.n.

Type species: *Euxestus robustus* Arrow, 1926a.

Gender: Masculine.

Etymology: the name is a combination of a prefix Globo- with the name *Euxestus* to indicate similarity between those genera.

Diagnostic combination - Length 2.5-3.5 mm; broadly-oval to almost rounded; strongly convex; winged; dorsum glabrous or sparsely microsetose. HEAD: antennal grooves on ventral side deep and reaching far behind eyes; antenna 10-segmented with 1-segmented, slightly asymmetrical club (fig. 71G); mouthparts similar to *Euxestus*, but mandibular prostheca with two sclerotized spines (fig. 71E). PROTHORAX: hypomera concave, without antennal cavities; anterior margin of prosternum distinctly emarginate laterally to receive antenna (fig. 71C), prosternum more-or-less carinate anteromedially; prosternal process about as wide as coxa. Mesosternal process wider than coxa; metasternum and ventrite I without femoral lines; ventrite IV with weak, sometimes almost obsolete, lateral expansions (fig. 71B). LEGS: tibiae weakly widened apically; tarsomere I broadly lobed below (fig. 71F); empodium present. ELYTRA almost smooth, rarely with vestigial rows of micropunctures; epipleura wide and complete (fig. 71D). WING (fig. 71A) with single, incomplete anal vein and without subcubital fleck. AEDEAGUS with median lobe weakly sclerotized, laminate; tegmen with the parameres completely reduced. No external differences between sexes.

Immature stages - Unknown.

Biology - Adults were extracted from forest leaf litter.

Distribution - Indonesia (Java, Sumatra); Philippines (Luzon, Mindanao); Malaysia (Sarawak, Sabah).

Species included - *G. javanus* (Arrow); *G. robustus* (Arrow).

Discussion - This genus is extremely similar externally to *Euxestus* but is distinguished by the anterior prosternal margin emarginate laterally to receive antenna, the prosternum weakly carinate antero-medially, ventrite IV with weak lateral expansions and the wing without a subcubital fleck. These characters are apomorphies with relation to most of the euxestine genera. The only other genus of Euxestinae without a subcubital fleck is *Metacerylon*; it differs from *Globoeuxestus* by having the anterior pronotal margin entire, one or two abdominal ventrites expanded laterally and fitting into a distinct emargination of the elytral epipleura, the antennal club symmetrical, ventrite I with distinct femoral lines, and tarsomere I simple.

Metaxestus gen.n.

Type species: *Metacerylon papuanus* Slipinski, 1982b.

Gender: Masculine.

Etymology: the name is an arbitrary combination of letters.

Diagnostic combination - Length 2.0-3.2 mm; narrowly-elongate, weakly convex; winged; dorsum glabrous. **HEAD**: antennal grooves on ventral side short and not reaching behind eyes (fig. 70F); antenna 10-segmented with 1-segmented club (fig. 70D), antennomere III about twice as long as IV; mouthparts similar to *Euxestus*, but prostheca with sclerotized apical spines (fig. 70G). **PROTHORAX** parallel-sided or weakly narrowing posteriorly, narrowly bordered laterally; prosternal process about as wide as coxa, widened apically (fig. 70B); procoxal cavities externally closed. Mesosternum with process as wide as coxa, flat; metasternum and ventrite I without femoral lines, ventrites without expansions (fig. 70A). **LEGS**: protibia weakly expanded apically, not spinose at outer-apical edge (fig. 70C); tarsi 4-4-4, tarsomeres simple; empodium reduced. **ELYTRA** parallel-sided, each with 10 rows of striae punctures; epipleura narrow, obsolete at extreme tip. **WING** (fig. 70E) with 2 anal veins and divided subcubital fleck. Aedeagus (fig. 66F) with median lobe heavily sclerotized, often spiral and at least twice as long as abdomen; tegmen sclerotized with an asymmetrical anterior lobe lying above the median lobe, almost circular and devoid of setae or distinct parameres. Sexual

characters: males of *M. papuanus* have hind tibiae emarginate at inner margins, these are simple in females and in other known species of the genus.

Immature stages - Unknown.

Biology - Some specimens were collected from under bark of trees.

Distribution - Africa (Zaire); Sri Lanka; Indonesia (Sumatra), Vietnam, Papua New Guinea.

Species included - *M. bicolor* (Grouvelle); *M. papuanus* (Slipinski); *M. antennatus* (Slipinski).

Discussion - *Metaxestus* shares with most species of *Metacerylon* a parallel-sided body, 10-segmented antennae with 1-segmented club and weakly expanded protibiae. *Metacerylon* and *Metaxestus* are easily separated by the presence of the femoral lines on the first abdominal ventrite, and expanded at least ventrite III in *Metacerylon*. *Hypodacne*, which has the wing with a subcubital fleck, simple tarsi and unexpanded ventrites, has femoral lines on the metasternum and a broadly-oval body.

Metacerylon Grouvelle

Metacerylon Grouvelle, 1906: 100. Type species, by monotypy, *Metacerylon parallellum* Grouvelle, 1906.

Micruloma Carter, 1919: 140. Type species, by original designation, *Acthosus minutus* Carter, 1906. **Syn. n.**

Ceryleuxestus Sen Gupta and Crowson, 1973: 389. Type species, by original designation, *Ceryleuxestus brasiliensis* Sen Gupta and Crowson, 1973. **Syn. n.**

Platyxestus Dajoz, 1982: 158. Type species, by original designation, *Platyxestus lenticularis* Dajoz, 1982. - Synonymized by Slipinski 1985a: 618. - Hinton 1941: 159; Heinze 1944a; Sen Gupta and Crowson 1973: 386-391; Slipinski 1980b: 405-411, 1982b: 40.

Diagnostic combination - Length 1.8-2.9 mm; body variable from almost cylindrical to broadly-oval and flattened; winged; dorsum glabrous. HEAD with antennal grooves on ventral side short and not reaching behind eyes; antenna 8-10 segmented with 1-segmented club (fig. 73B-D); mouthparts as in fig. 73H. PROTHORAX variable, laterally entirely margined; hypomera weakly concave, without antennal cavities or grooves; prosternal process about as wide as coxa, expanded apically (fig. 72C, D); procoxal cavities widely closed externally. Mesosternum with intercoxal process narrow in

cylindrical forms or about as wide as coxa in flattened forms; metasternum without femoral lines; ventrite I with short femoral lines (fig. 72A, B, 73A); ventrite rarely IV III, with lateral expansions. LEGS; tibiae expanded apically and weakly spinose at outer-apical margin (fig. 73G); tarsi 4-4-4, tarsomeres simple; empodium usually present, but not well-developed. ELYTRA always with regular rows of punctures; epipleura wide, incomplete at extreme tip, with shallow impressions receiving lobes of abdominal ventrites. WING (fig. 6A) with 1-2 anal veins, anal cell sometimes present, without subcubital fleck. AEDEAGUS (fig. 73E, F) with median lobe weakly sclerotized and lamellate; tegmen with parameres fused but distinctly setose, anterior lobe of tegmen asymmetrical and lying above the median lobe.

Immature stages - Unknown.

Biology - Adults were found under bark, in forest litter or in tunnels of ambrosia beetles.

Distribution - West, Central and East Africa; Madagascar and Mascarene Islands; Australia; West Indies: Hispaniola, Jamaica, Guadeloupe; Panama to Brazil; Argentina.

Species included - *M. amaroides* (Chevrolat); *M. brevicolle* (Fairmaire); *M. conradti* (Grouvelle); *M. decellei* Slipinski; *M. dufau* Grouvelle; *M. elongatum* Slipinski; *M. minutum* (Carter); *M. neotropica* Slipinski; *M. omercooperi* (Hinton); *M. parallelum* Grouvelle; *M. patens* (Grouvelle); *M. pressulum* (Dajoz); *M. striolatum* (Grouvelle); *M. wagneri* (Grouvelle);

Discussion - The generic concept presented here agrees with Heinze's (1944a), including the Australian species *M. minutum* that was retained in a separate genus *Micruloma* (Slipinski 1988a). The Australian species and species of former *Ceryleuxestus* form a well-defined monophyletic group with all transitional forms present between its members. The genus is well-defined by its anterior prosternal margin entire, at least ventrite III with lateral expansions fitting into depression of the elytral epipleura, femoral lines on the ventrite I short and not reaching lateral margins of the ventrite, protibia expanded apically and spinose and the wing without a subcubital fleck. The external similarities with *Metaxestus* are discussed under that genus (see p. 78).

C) SUBFAMILY LOEBLIORYLINAE subf. n.

This monotypic subfamily possesses some diagnostic features of Ceryloninae, including aciculate palpi (fig. 75A), absence of the fronto-clypeal suture, 11-segmented antennae with weakly flattened club and abdomen with 5 functional spiracles. However, it differs from all cerylonines as follows: in the form of the prosternal process, which is extremely narrow and does not reach behind coxae that are meeting below; the intercoxal process of the first abdominal ventrite is expanded ventrally partly covering coxae that are approximate; the smooth (not crenulate) hind margin of the last abdominal ventrite; and the tegmen with an articulated strut. The larva is unknown. The systematic position of the genus and subfamily is discussed on p. 21, 44.

Loebliorylon gen. n.

Type species: *Loebliorylon carinatus* sp. n.

Gender: Masculine.

Etymology: This genus is dedicated to my dear friend Dr. Ivan Löbl of the Natural History Museum of Geneva, who was one of the discoverers of this genus.

Diagnostic combination - Length 1.5-3.1 mm; elongate-oval; convex; wingless; very shortly setose; curculionid-form (fig. 41). HEAD: antenna 11-segmented with loose, 3-segmented club (fig. 74D); eyes always reduced to 1-3 facets, prominent (fig. 74A); mouthparts (fig. 75A-C, F) with prementum bearing four setae arranged as in fig. 75F. PROTHORAX almost circular in cross section, without clear lateral margins, the edges irregular and crenulate; pronotal disk with several elevations and depressions; prosternal process extremely narrow and not reaching behind coxae (fig. 74B); coxae contiguous below; coxal cavities externally and internally open. Mesosternal process $0.25 \times$ as wide as coxa (fig. 74E); metasternum and ventrite I without femoral lines; last ventrite not crenulate, often with sexual characters (see below). LEGS: stout and long, tibiae and femora often curved and crenulate or denticulate (fig. 75D, G) on inner surfaces; tarsi 4-4-4 (fig. 74C), tarsomeres simple; empodium absent. ELYTRA fused along suture; each with 9-10 rows of punctures, striae not grooved; intervals often granulose or carinate; epipleura absent (fig. 75H). Scutellum pentagonal, weakly transverse. AEDEAGUS with median lobe elongate, simple and curved (fig. 76A, E); tegmen

well developed (fig. 76B, F) with short parameres and long tegminal strut. Ovipositor as in fig. 76C, D; spiculum gastrale present, about as long as ovipositor. Sexual characters: males with hind tibiae more strongly crenulate or denticulate on inner surfaces; last ventrite often with prominent and setose process (fig. 17E, 18B, 75E).

Immature stages - Unknown.

Biology - Extracted from forest and leaf litter.

Distribution - Nepal; northern India (West Bengal); northern Thailand.

Species included - *L. carinatus* sp. n.

Discussion - see p. 21.

Loebliorylon carinatus sp. n.

Length 1.90-2.25 mm. Dark brown; surface feebly shiny; vestiture consists of whitish, appressed setae that are about as long as antennomere IV, especially abundant and visible on legs and raised areas of pronotum and elytra. HEAD: clypeus weakly rounded anteriorly; frons and vertex irregularly punctured, punctures subcontiguous and much larger than the single facet; antenna with antennomere IX almost as wide as antennomere X. Pronotum $0.96-1.10 \times$ as long as wide; disk with admedian incomplete, near middle interrupted, blunt carinae (fig. 41), the carinae reaching anterior margin and then not clearly joined anteriorly by a raised anterior margin, the posterior part behind the interruption forms a tubercle that is almost not continuing towards the posterir margin; laterally behind the level of interruption of the admedian carinae there are two irregular tubercles continuing anteriorly as a weak carina; lateral margin not visible from above and not clearly marked, forms weak carinae reaching anterior angles that are acute and located more ventrally and not visible from above; pronotal punctures irregular and partly obliterated, well visible laterally where almost contiguous and several times larger than those on head. Elytra $1.1-1.2 \times$ as long as wide and $1.4-1.5 \times$ as long as pronotum, widest behind humeri and narrowing apically, jointly rounded at pexes: each elytron with 5 carinae on intervals 3, 5, 7, 9 and 10, only carina I complete from base to apex, carinae II and III stopping shortly before apex, and IV, V visible only near base up to a level of metacoxe; all carinae irregularly crenulate and setose; elytral punctures as large as those on lateral parts of pronotum, irregular and

longitudinally separated by about 0.5 diameters. LEGS: profemur with weak tooth at middle on its external margin, protibia as long as femur with tooth on inner margin near base; mesofemur and tibia smooth on inner surfaces; metafemur approximately as long as mesotibia and mesofemur combined with blunt tooth on inner surface near middle, metatibia slightly curved inwardly and almost smooth on inner surfaces; length of protibia 0.4-0.5 mm, mesotibia 0.4-0.5 mm, metatibia 0.7-0.8 mm. Sexual characters: this species does not have striking sexual characters, male can be recognized in having slender pronotum and the last abdominal ventrite with dense golden pubescence but without a process (found in three other underscribed species). Aedeagus as in fig. 76E, F.

HOLOTYPE (female): Thailand, Chiang Mai, Doi Inthanton, 7.XI.1985, D. Burckhardt & I. Löbl (MHNG).

PARATYPES (1, MHNG; 1, IZPAN): same data as holotype.

D) SUBFAMILY MURMIDIINAE

Murmidiides Jaquelin Du Val, 1857: 227.

Mychocerinae Sharp, 1895: 494 - Invalid because based on a junior homonym (*Mychocerus* LeConte nec Erichson).

DIAGNOSTIC COMBINATION

ADULTS

Body broadly-oval, moderately to strongly convex; winged; dorsum glabrous or sparsely microsetose. Head with transverse occipital ridge and fronto-clypeal suture. Antenna 8-11-segmented with club cylindrical, not flattened and usually 1-segmented (fig. 17D). Mouthparts: labrum transverse with labral rods well defined, club-like, tormal mesal arms oblique, outer arms slender, not clearly fused to mesal arms (fig. 79F); mandible (fig. 78H) tridentate apically with basal mola and prosthema well-developed; maxillary palp (fig. 12D) with last palpomere slightly narrowing apically and always longer than the penultimate segment, lacinia with apical spine; labium with ligula usually bilobed (fig. 79C). Prothorax with antennal cavities situated in anterior part (fig. 14F, 77B); procoxal cavities externally and internally open; prosternal process parallel-sided or slightly narrowing apically. Mesosternal process usually wider than coxa, flat; metasternum and ventrite I always with femoral lines, median impressed

line on metasternum usually present. Wing (fig. 6B) without jugal lobe and anal veins, but with divided subcubital fleck. Abdomen with 5 pairs of functional spiracles, last ventrite inflexed and crenulate. Aedeagus with tegmen symmetrical bearing ventral, unarticulated strut; parameres usually present; median lobe weakly sclerotized, simple. Ovipositor strongly reduced, without styli (fig. 9A); spiculum gastrale absent.

LARVA (*Murmidius*, fig. 22-23)

Broadly oval, strongly flattened and disk-like; vestiture consists of barbed setae. Head with distinct median endocarina; stemmata absent; antenna moderately long, about $0.5 \times$ as long as head width. Mandible with basal asperate mola and hyaline protheca. Mala obtuse, without apical spine; maxillary articulating area present. Hypostomal rods absent. Spiracles annular not placed on tubular processes. Urogomphi absent.

KEY TO GENERA OF MURMIDIINAE

1. Antenna 8-segmented (fig. 79B); prosternal process narrowing apically (fig. 79A) and not wider than coxa; metasternum without median impressed line *Botrodes* (p. 87)
- Antenna 9-11-segmented; prosternal process parallel-sided or widened apically, much wider than coxa (fig. 77A); metasternum with median impressed line 2
2. Antennal cavities on prothorax dorsal (fig. 77B); antenna 10-11-segmented, antennomeres symmetrical (fig. 77D); mesosternum rounded anteriorly; tibiae usually widened apically or angled (fig. 77E); body convex *Murmidius* (p. 84)
- Antennal cavities on prothorax ventral (fig. 78C); antenna 9-segmented with antennomeres 3-6 more-or-less asymmetrical (fig. 78A); mesosternum truncate anteriorly; tibiae narrow, not widened or angled (fig. 78B); body flat *Mychocerinus* (p. 86)

Murmidius Leach

Murmidius Leach, 1822: 41. Type species, by monotypy, *Murmidius ferrugineus* Leach, 1822 [= *M. ovalis* (Beck, 1817)].

Ceutocerus Germar, 1824: 85. Type species, by monotypy, *Ceutocerus advena* Germar, 1824: 85 [= *M. ovalis* (Beck, 1817)]. - Synonymized by Jaquelin du Val 1857: 227. - Hinton 1935b: 237, 1942b: 39-45, 1945; Sen Gupta and Crowson 1973: 395; Lawrence and Stephan 1975: 141; Slipinski, 1988a.

Diagnostic combination - Length 1.8-2.9 mm; broadly-oval (fig. 42), usually convex; winged; dorsum glabrous or shortly microsetose. HEAD; clypeus large and expanded apically (fig. 77C); eyes usually large, rarely reduced to a few coarse facets; antenna 10-11-segmented with 1-2-segmented club (fig. 77D), scape strongly asymmetrical, antennomere IX elongate; mouthparts typical for the subfamily (fig. 12D). PROTHORAX with antennal cavities situated dorsally at anterior angles (fig. 77B); prosternum prominent anteriorly into a plate covering head from below when retracted, the plate usually with two pairs of lines; prosternal process about twice as wide as coxa; coxal cavities externally open, internally almost closed but the internal bar is incomplete. Mesosternum with intercoxal process about twice as wide as coxa (fig. 77F). Metasternum usually with complete median impressed line and femoral lines. Ventrite I with complete femoral lines (fig. 77H). LEGS: tibiae usually widened apically, often angled at outer margin (fig. 77E); tarsi 4-4-4, tarsomeres simple; empodium absent. ELYTRA with or without strial punctures; epipleura very narrow and distinctly emarginate at level of metacoxae. AEDEAGUS (fig. 7B, 77G) with median lobe bearing a short ventral strut; parameres not distinct but sometimes tegmen emarginate apically and setose. Ovipositor as in fig. 9A. No external differences between sexes.

Immature stages - The larva of *M. ovalis* has been illustrated by Böving and CRAIGHEAD (1931) and by HALSTEAD (1968) who also figured the egg, pupa and the pupal cocoon (fig. 22B, C).

Biology - *M. ovalis* is usually associated with stored products and often found in granaries and warehouses; other species are recorded from under bark, dead leaves, cut grass piles and old hay.

Distribution - *M. ovalis* is a cosmopolitan, while *M. segregatus* is a subcosmopolitan including Mexico, most of the Oriental and Afrotropical regions, being imported to Europe. Other species are known from: southwestern Africa, Ivory Coast, Zaire; India; Indonesia (Sumatra); Vietnam; Singapore; and from Mexico to Chile, Brazil and Argentina.

Species included - *M. globosus* Hinton; *M. irregularis* Reitter; *M. ovalis* (Beck); *M. segregatus* Waterhouse; *M. stoicus* Hinton; *M. tydeus* Hinton.

Discussion - This genus is characterized by its antennal cavities situated on the dorsal side of the prothorax, the tibiae angled on outer margins and the tegmen without parameres. The remaining characters seem to represent plesiomorphic conditions in relation to other genera of the Murmidiinae.

Myhocerinus Nom. nov.

Myhocerus LeConte, 1869: 255. Type species, by monotypy, *Murmidius depressus* LeConte, 1866 nec *Myhocerus* Erichson, 1845: 293 (see p. 138). - Sen Gupta and Crowson 1973: 399; Lawrence and Stephan 1975: 142.

Diagnostic combination - Length 0.9-2.0 mm; broadly-oval; flattened; winged; dorsum shortly pubescent. **HEAD**: clypeus slightly expanded apically; antenna 9-segmented with 1-segmented club, antennomeres III-VI more-or-less asymmetrical (fig. 78A); mouthparts as in fig. 78E, G, H. **PROTHORAX** with antennal cavities situated ventrally near anterior angles (fig. 78C); prosternal process $3.0-3.5 \times$ as wide as coxa; prosternal lines variable; procoxal cavities open externally and internally. Mesosternal process $2.0-2.5 \times$ as wide as coxa, subrectangular; metasternum with median impressed line and complete femoral lines; ventrite I with femoral lines (fig. 78D). **LEGS**: tibiae not markedly widened apically, never angled at outer margin (fig. 78B); tarsi 4-4-4; tarsomeres simple; empodium absent. **ELYTRA** with 8-9 regular rows of stria punctures; epipleura narrow but complete. **AEDEAGUS** with median lobe simple, almost straight (fig. 78F); tegmen with well developed, articulated parameres and ventral unarticulated strut. Ovipositor not examined. No external differences between sexes.

Immature stages - Unknown.

Biology - Adults have been collected under bark of various trees often infested by fungi.

Distribution - Eastern North America, from Southern Ontario, south to Florida and west to eastern Texas; Mexico (southeastern and southern Sonora, Veracruz); Paraguay; New Caledonia.

Species included - *M. depressus* (LeConte); *M. arizonensis* (Lawrence and Stephan); *M. pilifer* (Lewis).

Discussion - *Myhocerinus* represents the subcortical inhabiting line of Murmidiinae with its extremely flat body, widely

separated coxae, and antennal cavities situated ventrally. *Botrodo* has the ventral antennal cavities, but it has the 8-segmented antenna, the prosternal process narrow and the metasternum without a median impressed line. *Botrodo* are more convex, almost smooth and parallel-sided compared to the convex and ovate *Murmidius* or the flat and ovate *Myhocerinus*.

Botrodo Casey

Botrodo Casey, 1890: 320. Type species, by monotypy, *Botrodo estriatus* Casey, 1890. - Sen Gupta and Crowson 1973: 396; Lawrence and Stephan 1975: 145.

Diagnostic combination - Length 1.5-2.2 mm; body elongate-oval; weakly convex; winged; dorsum glabrous. **HEAD**: clypeus smaller and less strongly expanded anteriorly than in *Murmidius*; antennal grooves on ventral side distinct; antenna 8-segmented with 1-segmented club (fig. 79B); mouthparts as in fig. 79C-F. **PROTHORAX** with antennal cavities not visible from above, situated ventrally and covered by elevated prosternal plate from beneath (fig. 79A), the plate with a pair of lines along sterno-pleural sutures only; prosternal process about as wide as coxa and narrowing apically; coxal cavities open externally and internally. Mesosternum about 1.0-1.2 × as wide as coxa, almost rectangular but anterior margin rounded; metasternum with femoral lines but with median impressed line obsolete, rarely anteriorly. Ventrite I with femoral lines. **LEGS**: tibiae slender; protibia with indistinct tooth at outer-apical angle; tarsi 4-4-4, tarsomeres simple; empodium absent. **ELYTRA** almost smooth, rarely with sutural row of punctures; epipleura relatively wide, complete. **AEDEAGUS** (fig. 79 G-H) with median lobe short and simple; tegmen with well developed, articulated parameres and short, ventral unarticulated strut. Ovipositor not examined. No external differences between sexes.

Immature stages - Unknown.

Biology - Unknown.

Distribution - USA (Florida, Texas); Mexico; Jamaica; Guadeloupe.

Species included - *B. dufai* Grouvelle; *B. estriatus* Casey; *B. championi* n. nov. for *B. estriatus* (Champion, 1913) (*Murmidius*) nec *B. estriatus* Casey, 1890.

Discussion - The genus probably represents the most advanced known form of Murmidiinae, and is characterized by the

antennal cavities situated on the ventral side of the prothorax, the antennae being 8-segmented, the metasternum lacking the entire median impressed line, and the prosternal process narrower than the coxal diameter and partly covered by the projecting mesosternum.

E) SUBFAMILY OSTOMOPSINAE

Ostomopsini Sen Gupta and Crowson, 1973: 400.

Ostomopsinae: Lawrence and Stephan 1975: 146.

This monogeneric subfamily was considered as a tribe within Murmidiinae because of its non-aciculate palpi, fronto-clypeal suture, crenulate hind margin of the last ventrite, and five abdominal spiracles. The diagnostic characters are discussed under the generic diagnosis. The larva is unknown.

Ostomopsis Scott

Ostomopsis Scott, 1922: 250. Type species, by original designation, *Ostomopsis solitaria* Scott, 1922. - Sen Gupta and Crowson 1973: 400; Lawrence and Stephan 1975: 146.

Diagnostic combination - Length 0.9-2.1 mm; elongate-oval to broadly-oval, moderately convex; winged; surface densely setose. HEAD without occipital ridge; fronto-clypeal suture present; eyes large, slightly prominent (fig. 80A); antenna 10-segmented with 1-segmented club, the club weakly emarginate laterally near middle and bears specialized branched sensilla (fig. 17C, 80C); mouthparts characteristic as in fig. 12B, 81A, C, E, F. PROTHORAX transverse with sides widely explanate and margins crenulate to serrate and setose; prosternum without antennal grooves or cavities (fig. 80D); prosternal process parallel-sided; coxal cavities externally and internally open. Mesosternum about as wide as coxa, flat; metasternum and ventrite I without femoral lines (fig. 80E). LEGS: tibiae slender, protibia rounded at outer-apical angle; tarsi 3-3-3 (fig. 80F), tarsomere simple, empodium present. ELYTRA with 9-10 rows of punctures; intervals flat; epipleura wide and complete (fig. 81D); elytral margins near base often serrate; scutellum large, pentagonal (fig. 89B). AEDEAGUS with median lobe elongate bearing dorsal and ventral struts (fig. 81B); tegmen with fused parameres but with dorsal articulated strut (fig. 81I); sternite VIII as in fig. 81G, H; ovipositor not examined, but according to PAL and LAWRENCE (1986) with developed styli and spiculum gastrale present. No apparent differences between sexes.

Immature stages - Unknown.

Biology - *Ostomopsis neotropicalis* is possibly associated with rotten palm wood; specimen from New Caledonia (3 species) were found under bark or extracted from leaf and log litter.

Distribution - Seychelles Islands; Thailand; New Caledonia and Loyalty Islands; USA: Florida; Cuba; Mexico, Panama (Canal Zone).

Species included - *O. neotropicalis* Lawrence and Stephan; *O. solitaria* Scott.

Discussion - see p. 43.

F) SUBFAMILY CERYLONINAE

Cerylonides Billberg, 1820: 47.

Pleosomides Fauvel, 1891: 62.

Lapethinae Sharp, 1894: 445 (in key), 1895: 494.

Aculagnathidae Oke, 1932: 22.

Dolosidae Dajoz, 1963: 91.

DIAGNOSTIC COMBINATIONS

ADULT

Body variable, from very flat and parallel-sided (*Cerylon*, *Philothermopsis*) to compact, broadly-oval and convex (*Mychocerus*, *Axiocerylon*, *Pseudolapethus*); winged or wingless; dorsum glabrous to densely setose; vestiture usually consists of simple or strong setae, very rarely (*Axiocerylon*, *Cautomus*) setae are scale-like. Head without the fronto-clypeal suture and rarely transverse occipital ridge (*Mychocerus*, *Pseudolapethus*, *Axiocerylon*, *Rostrorylon*, *Glomerylon*). Antenna 6-11 segmented with club usually flattened and composed of 1-3 segments. Mouthparts: labrum subquadrate to markedly elongate (fig. 2A, B) with labral rods narrow and lightly sclerotized, never clubbed, tormal mesal arms perpendicular or (in strongly prominent labrum) slightly produced forwardly, outer tormal arms widened posteriorly and always fused with the mesal arms; mandible unidentate apically with inner margins more-or-less serrate, sometimes strongly elongate and blade-like, mola moderately developed, transversely ridged to almost obsolete in strongly modified forms, prostheca fringed, well-developed; maxillary palps aciculate with last palpomere narrowing apically and much narrower than the penultimate one, galea and lacinia

slender, hairy apically, never with apical spine; mentum elongate to subquadrate, ligula usually expanded apically and sparsely setose at anterior margin; prementum almost always sparsely setose, labial palps more-or-less similar to the maxillary ones but always shorter. Prothorax subquadrate to transverse with antennal cavities, if present, situated either on the hypomera or in front of posternum near its anterior margin (fig. 13A-F, 14A, C-E). In compact forms head deeply retracted into prothorax with anterior part of prosternum produced and elevated to form a plate covering the gular region from beneath. Procoxal cavities internally open, externally open or closed; prosternal process variable from narrow and parallel-sided (*Philothermus*) to wide and markedly expanded apically (*Cerylon*, *Paracerylon*). Mesosternal process usually about $0.5 \times$ as wide as coxal diameter; metasternum rarely, ventrite I frequently with femoral lines. Wing without jugular lobe, anal cell and subcubital fleck (fig. 5A), with 1-2 reduced anal veins. Legs with trochanters elongate to weakly heteromeroid, tibiae often expanded apically, and the anterior one with or without apical tooth on outer-apical angle; tarsi 3 or 4-segmented, segments usually simple (lobed in *Gyreleon* and some *Angolon* only); empodium usually present. Abdomen with 5 pairs of functional spiracles, last ventrite inflexed and crenulate. Aedeagus simple with tegmen strongly reduced to absent, median lobe short, weakly curved and heavily sclerotized, usually lying on its side when retracted. Ovipositor (fig. 8A-B) well-developed with long styli; spiculum gastrale present.

LARVA (*Cerylon*, *Philothermus*, *Mychocerus*, fig. 24-29)

The known larvae of Ceryloninae are characterized by their elongate to slightly onisciform body that is lightly sclerotized; thoracic and abdominal terga more-or-less expanded laterally, often bearing scale-like or divided setae; stemmata absent and the head lacking frontal and fronto-clypeal sutures; antenna moderately long, about $0.3-0.5 \times$ as long as head width, with long sensory appendage and antennomere III with 2-3 apical setae; the mouthparts are strongly elongate and adapted for piercing with stylet-like mandibles (lacking basal mola and prostheca), either endognathous (*Cerylon*) or united into a piercing beak (*Philothermus*, *Mychocerus*); maxillary articulating area and hypostomal rods absent; spiracles annular, located under the tergal processes; abdominal tergum 8 without urogomphi.

KEY TO GENERA OF CERYLONINAE

1. Antenna 11-segmented with 3-segmented club (fig. 84F, 85A, 88C) 2
 - Antenna variable; club composed of 1 or 2 segments 4
2. Pronotum and elytra explanate laterally and margins not visible from above; head partially covered from above [Oriental] *Coccilon* (p. 106)
 - Pronotum and elytra not explanate laterally, margins wide and well visible from above, more-or-less upturned; head not hidden under prothorax 3
3. Prosternum strongly elevated antero-medially (fig. 85E) with poorly defined cavities laterally; elytra with alternate intervals costate (fig. 45); tegmen of aedeagus complete; dorsum microsetose or apparently glabrous [Neotropical] .
..... *Glyptolopus* (p. 104)
 - Prosternum not elevated anteromedially, without antennal cavities (fig. 84A); elytral intervals flat; tegmen of aedeagus obsolete; dorsum densely setose [Neotropical]
..... *Pakalukia* (p. 102)
4. Tarsi 3-3-3 and anterior tibia always with distinct tooth at outer-apical angle (fig. 94G, 96B, D, 104H) 5
 - Tarsi 4-4-4 or anterior tibia rounded at outer-apical angle (fig. 83C, 87C) 8
5. Posternum without traces of antennal cavities; elytral intervals always flat [Old World] *Philothermopsis*, part (p. 124)
 - Prosternum always with more-or-less defined antennal cavities (fig. 103A, 104A, B); elytral intervals often convex or carinate 6
6. Antennal cavities not well defined and situated on the hypomera (fig. 104A, B); pronotal disk almost smooth medially, with sides upturned and widely margined (fig. 14E); femoral lines on ventrite I separated apically (fig. 104C); elytra glabrous with at least one interval carinate (fig. 53) [Africa] *Suakokoia* (p. 128)
 - Antennal cavities well defined and situated on sides of prosternum (fig. 103A); pronotal disk regularly punctured with margins narrow and scarcely visible from above;

- femoral lines of ventrite I joined apically (fig. 103C); elytral intervals flat or convex 7
7. Pronotum with weak sublateral carina; elytral intervals weakly convex or subcostate [Africa] *Belingaia* (p. 126)
- Pronotum flat, without carinae; elytral intervals flat [Africa] *Nkolbissonia* (p. 127)
8. Antennal club with 2-3 apical sensory appendages; pronotal sides crenulate and setose, not clearly margined; elytral punctures dense but confused (fig. 4C); males almost always with inner-apical spines on tibiae (fig. 4E-G); prosternum more-or-less raised anteromedially (fig. 14C) [Indo-Australian] *Cautomus* (p. 130)
- Antennal club without sensory appendages; no other characters in combination 9
9. Prosternum with antennal cavities either on sides of prosternum that is elevated anteromedially or on hypomera (fig. 13A-F, 14D, 82G); rarely (*Acautomus*) prosternum strongly elevated antero-medially but antennal cavities not clearly delimited (fig. 91) 10
- Prosternum without traces of antennal cavities, its anterior margin not emarginate laterally to receive antenna but continuing laterally to meet anterior angles (fig. 87A); no other characters in combination 24
10. Tarsomere I lobed below (fig. 93F); antennal grooves short; prosternal process deeply emarginate apically forming three-teeth structure (fig. 13A, 93H) to receive prominent process of mesosternum (fig. 93I) [Oriental] . *Gyreleon* (p. 112)
- Tarsomere I almost always simple; no other characters in combination 11
11. At least hind femora with large tooth at inner margin (fig. 91F); prosternum strongly carinate anteromedially and usually prominent before anterior margin (fig. 91A); antennal cavities not clearly defined; all elytral intervals weakly convex and serrate [Madagascar] *Acautomus* (p. 110)
- Femora never dentate; prosternum with clearly defined antennal cavities or grooves; no other characters in combination 12

12. Prosternum deeply but narrowly notched anteromedially (fig. 13D, 15C) to receive markedly elongate mouthparts when retracted [Neotropical] *Rostrorylon* (p. 135)
- Prosternum never notched anteromedially 13
13. Pronotum with median sharp carina (fig. 54); elytra with alternate intervals costate-tuberculate, carina I with bifid tubercle apically; antennal cavities on hypomera present but not well defined (fig. 1031) [Neotropical] *Izieus* (p. 129)
- Pronotum never with median carina; elytra, if costate, with costae without tubercles. No other characters in combination 14
14. Antennal cavities situated at prosternal sides not on hypomera; anterior margin of prosternum not distinctly emarginate laterally to receive antenna (fig. 82G) 15
- Antennal cavities clearly defined on hypomera (fig. 13B) or anterior margin of prosternum deeply emarginate laterally to receive antennal funicle forming a groove (fig. 13C, F) 16
15. Mouthparts of piercing-type (fig. 82A,C,D); dorsum densely setose; prosternum between cavities coarsely punctured (fig. 82G); prementum with setae as in fig. 82A [New World] *Philothermus*, part (p. 98)
- Mouthparts normal or weakly elongate, mandible never bladelike but always clearly bidentate apically; dorsum glabrous or sparsely setose; prosternum between cavities smooth or micropunctured (fig. 89A); prementum with setae as in fig. 89B [Malagasy] *Pathelus* (p. 107)
16. Tarsi 3-3-3; prosternum, metasternum and ventrite I with tarsal grooves (fig. 14D, 15A, 113A, B) [Africa] *Angolon* (p. 145)
- Tarsi 4-4-4; metasternum and ventrite I without tarsal grooves 17
17. Antennal cavities situated near anterior angles on pronotal hypomera, clearly limited posteriorly; prosternum prominent anteriorly into a plate covering head from beneath when retracted, and often partially covering antennal cavities (fig. 13B, 108A) 18
- Antennal cavities situated on lateral parts of prosternum forming narrow grooves (fig. 13C, F) or if on hypomera then reaching far behind middle and never covered by a prosternal plate from beneath (fig. 13E, 111B) 20

18. Antenna 11-segmented with 2-segmented club (fig. 108B); antennal cavities almost completely covered by the prosternal plate from beneath (fig. 108A) [Oriental] *Neolapethus* (p. 137)
 - Antenna 8 or 10-segmented with 1-segmented club; antennal cavities at most partially covered from beneath (fig. 109C) 19
19. Elytral epipleura dentate at metacoxa (fig. 111H); clypeus and prosternal plate acutely prominent to fit each other when retracted (fig. 110A,C); hypomeron below antennal cavities with weak tarsal grooves (fig. 13B); scutellum almost invisible from above; elytral intervals convex [Neotropical] *Pseudolapethus* (p. 140)
 - Elytral epipleura smooth, not dentate; clypeus and anterior margin of prosternum rounded or almost straight; hypomera without tarsal grooves (fig. 109C); scutellum visible; elytral intervals almost always flat [World] *Mychocerus* (p. 138)
20. At least two elytral intervals carinate (fig. 1); antennal cavities on hypomera reaching almost hind margin of prosternum (fig. 111B) 21
 - Elytral intervals flat or weakly convex, never distinctly carinate; antennal cavities on hypomera weak (fig. 13F) or clearly limited posteriorly not reaching posterior margin of prosternum (fig. 13E) 22
21. Pronotum with characteristic pattern of transverse tubercles and grooves (fig. 1,111A); antennal club 1-segmented, or apparently 1-segmented (*cavicolle*); femoral lines on metasternum and ventrite I vestigial but present (fig. 111C) [Old World] *Axiocerylon* (p. 142)
 - Pronotum with 8 tiny tubercles arranged in two transverse rows (fig. 60); antennal club clearly 2-segmented; femoral lines absent [Australia] *Lawrenciella* (p. 141)
22. Antennal cavities on hypomera deep and delimited posteriorly (fig. 13E, 15F); pronotum usually with two (rarely one) irregular translucent areas on each side (fig. 61); dorsum densely and coarsely punctured; elytral intervals often weakly convex; protibia widened apically and dentate at outer-apical angle [Old World] *Thyroderus* (p. 144)

- Antennal cavities on hypomera not clearly delimited posteriorly (fig. 13C, F); pronotum without translucent areas; no other characters in combination 23
- 23. Antenna 10-segmented with 1-segmented club (fig. 106D); pronotum with weak transverse groove along base (fig. 59); femoral lines complete; tegmen present [Neotropical] *Lapethinus* (p. 134)
- Antenna 9-segmented with 2-segmented club (fig. 105H); pronotum without transverse groove; femoral lines vestigial (fig. 105B); tegmen absent [Oriental] *Glomerylon* (p. 132)
- 24. Femoral lines on ventrite I present, but often vestigial 25
- Femoral lines on ventrite I absent 26
- 25. Elytron with 5th stria deeply grooved near humeri (fig. 52), or is much more strongly impressed than 6th stria; males with protibiae usually strongly widened apically, often clavate, and last abdominal ventrite with shallow setose impression; body large, usually black or bicoloured (red and black) [Old World] *Afrorylon* (p. 122)
- Elytron with 5th stria not grooved near humeri or regularly impressed on its entire length; males without strongly widened, clavate tibiae or apparent sexual characters on ventrite V; body usually flattened and reddish brown [Old World] *Philothermopsis*, part (p. 118)
- 26. Anterior tibia more-or-less dilated apically and distinctly dentate at outer-apical angle (fig. 94G, 100G); procoxal cavities externally closed (fig. 97A, 100A) 27
- Anterior tibia obtusely rounded at outer-apical angle and usually not dilated apically (fig. 87C, 90H); procoxal cavities variable 32
- 27. Mesosternum with distinct process between coxae (fig. 94C); prosternal process emarginate and concave apically to receive the mesosternal process (fig. 94A); pronotum with lateral margins invisible from above; body stout and densely setose [Oriental] *Clavicerylon* (p. 113)
- Mesosternum flat, without a process; prosternal process not emarginate apically; no other characters in combination 28
- 28. Males usually with spines on apicomesal angles of all tibiae (fig. 92C,E), rarely on anterior and posterior pairs only;

- antenna slender with antennomere III at least $2 \times$ longer than IV, and antennomeres III-VII elongate (fig. 92F,G); body narrowly-elongate, flat and glabrous; pronotum elongate, narrowing basally; median lobe of aedeagus with long basal piece (fig. 92D); tegmen always present, complex [Oriental] *Spinocerylon* (p. 111)
- Males without spines on legs; antennomere III usually only slightly longer than IV, IV-VIII subquadrate or transverse; pronotum usually rounded laterally, if parallel-sided tegmen absent; dorsum often convex and setose 29
29. Prosternal process wider than coxa, gradually and markedly widened apically (fig. 97A, 98C); aedeagus without tegmen 30
- Prosternal process narrower than coxa, parallel-sided for basal $2/3$ then abruptly widened apically (fig. 99E, 100A); aedeagus with tegmen 31
30. Body apparently glabrous, flattened; empodium present; body usually narrowly-elongate; median lobe of aedeagus with simple ornamentation (fig. 97G) [Holarctic] *Cerylon* (p. 117)
- Body sparsely but distinctly setose; empodium absent; body usually broadly-oval; median lobe of aedeagus with varied complex ornamentation (fig. 96A) [Oriental] *Paracerylon* (p. 116)
31. Male with last ventrite deeply emarginate apically (fig. 99C); mouthparts not of elongate type; prementum as in fig. 99G; tegmen usually with well-developed ventral ring-like structure; [Indo-Australian] *Australiorylon* (p. 120)
- Male with last ventrite not emarginate, rarely with processes or other structures; mouthparts elongate-type; prementum as in fig. 100H; tegmen strongly asymmetric, without ventral ring (fig. 100F) [Oriental] *Orientrylon* (p. 121)
32. Prosternal process deeply notched apically to receive median mesosternal keel (fig. 90A); antenna 11-segmented with 2-segmented club; metasternum with vestigial femoral lines; body broadly-oval, setose [Africa] *Ellipsorylon* (p. 109)
- Prosternal process straight or weakly emarginate apically, if more strongly emarginate (*Pseudocerylon*) antenna 10-segmented with 1-segmented club and dorsum glabrous; metasternum without femoral lines 33

33. Ventral side of head with long, acute processes laterally (fig. 95C); tegmen absent and median lobe extremely elongate (fig. 95E) [Oriental] *Oroussetia* (p. 115)
- Ventral side of head without processes; tegmen and median lobe different 34
34. Pronotal and elytral sides widely explanate, pronotum partially covering head; antenna 11-segmented with antennomeres II-VIII elongate and club weakly 3-segmented [Oriental] *Coccilon* (p. 101)
- Pronotal and elytral sides not explanate, head free; antennal club 1-2 segmented and antennomeres II-VIII subquadrate 35
35. Prosternal process wider than coxa, widened apically (fig. 87A, 98C); body short-oval; procoxal cavities widely closed externally 36
- Prosternal process much narrower than coxa and almost parallel-sided; body usually elongate; procoxal cavities open or very narrowly closed externally 37
36. Prosternum weakly keeled anteromedially (fig. 87A); wingless; aedeagus with tegmen (fig. 87F); scutellum large. [Madeira] *Ploeosoma* (p. 105)
- Prosternum not keeled; winged; aedeagus without tegmen; scutellum very small [Oriental] *Pseudocerylon* (p. 119)
37. Pronotum cordiform (fig. 47), narrowing posteriorly; large species, length 4-6 mm; aedeagus with tegmen strongly reduced [Oriental] *Pachylon* (p. 114)
- Pronotum never strongly cordiform; length usually less than 3,1 mm; aedeagus with tegmen usually complete 38
38. Pronotal edges crenulate, not clearly margined; pronotal surface with shallow, round to irregular, flat-bottomed, coarse, contiguous punctures (fig. 18A), each with median setigerous tubercle or pore; elytra with 8th interval forming lateral borders, well-visible from above; elytral punctures coarse and intervals often convex; antenna stout and short, 10-segmented with 1-segmented club [Oriental] *Ectomicrus* (p. 101)
- Pronotal edges usually smooth, rarely faintly crenulate, margined; pronotal punctures usually small and not contiguous, never with setigerous tubercles; elytra with 8th

interval normal, marginal lines usually visible from above; elytral intervals flat and striae punctures round; antenna slender and elongate, usually 11-segmented with 2-segmented club (fig. 43) [World] *Philothermus*, major part (p. 92)

Philothermus Aubé

- Philothermus* Aubé, 1843: 93. Type species, by original designation, *Philothermus montandoni* Aubé, 1843.
- Pseudophilothermus* Dajoz, 1973: 154. Type species, by original designation: *Cerylon semistriatum* Perris, 1866. (subgenus). **Syn. n.**
- Cerylcautomus* Sen Gupta and Crowson, 1973: 439. Type species by original designation, *Cerylcautomus floridensis* Sen Gupta and Crowson, 1973. **Syn. n.**
- Neoglyptus* Dajoz, 1974a: 22. Type species, by original designation, *Neoglyptus jamaicensis* Dajoz, 1974a nec *Neoglyptus* Basilewsky, 1953: 181 (Coleoptera, Carabidae). Synonymized with *Cerylcautomus* by Slipinski 1982c: 59.
- Kenyalon* Dajoz, 1974a: 24. Type species, by original designation, *Kenyalon microphthalmum* Dajoz, 1974a. **Syn. n.**
- Comalon* Dajoz, 1974a: 26. Type species, by original designation, *Comalon peruvianum* Dajoz, 1974a. **Syn. n.**
- Pologlyptus* Dajoz, 1974a: 29. Type species, by original designation, *Pologlyptus madagascariensis* Dajoz, 1974a. **Syn. n.**
- Caecodium* Dajoz, 1974a: 30. Type species, by original designation, *Caecodium franzi* Dajoz, 1974a. **Syn. n.**
- Neoglyptoides* Dajoz, 1976a: 258. (New name for *Neoglyptus* Dajoz).
- Bafutia* Dajoz, 1978: 179. Type species, by original designation, *Bafutia microphthalmum* Dajoz, 1978. **Syn. n.**
- Madacerylon* Dajoz, 1980: 246. Type species, by original designation, *Madacerylon peyrrierasi* Dajoz, 1980. **Syn. n.**
- Reitter 1876b; Hinton 1935a: 214; Dajoz 1981b: 68.

Diagnostic combination - Length 1.0-2.9 mm; body elongate to elongate-oval (fig. 43); moderately convex; usually winged; glabrous to densely setose. **HEAD:** antenna 10-11 segmented with 1-2 segmented club; mouthparts variable, from normal-type to extremely elongate piercing-type (fig. 82A, C-D); prementum with setae arranged as in fig. 82A. **PRONOTUM** variable; antennal cavities on prosternum (fig. 82G) rarely present, weak; prosternal process parallel-sided; procoxal cavities externally open or, rarely narrowly closed behind by the notal projections, never by the expanded prosternal process. Mesosternal process narrow, about 0.5 × as wide as coxa; metasternum and ventrite I without femoral lines. **LEGS:** protibia always rounded at outer-apical angle; tarsi 4-4-4, tarsomeres simple; empodium present. **ELYTRA** always with regular rows of punctures; intervals flat; epipleura narrow and incomplete at extreme tip; scutellum well visible, moderately large; wing without anal veins. **AEDEAGUS** always with tegmen; median lobe with relatively simple

ornamentation, rarely complicated (fig. 82E, F). Sexual characters: in two species-groups males can easily be recognized having metatibiae curved and often cernulate on inner margins, rarely with weak spine on inner-apical angle or crenulations on inner parts of metafemora.

Immature stages - Sen Gupta and Crowson (1973: 423) described a presumed larva of *P. bicavus* Reitter from New Zealand; see also p. 32 for description of larva of *P. glabriculus* LeConte.

Biology - Most of the specimens have been collected under bark or extracted from forest and log litter; *P. newtoni* has been collected from polypore fungi but not in large numbers. The larval mouthparts suggest a fungal or mycetozoan association.

Distribution - Almost cosmopolitan.

Species included - *P. addendus* (Slipinski); *P. ankara-trae* (Dajoz); *P. anosyensis* Dajoz; *P. australicus* Dajoz; *P. bafut* n. nov.; *P. bicavus* Reitter; *P. caledonicus* Dajoz; *P. carinatus* (Grouvelle); *P. centralis* (Slipinski); *P. cerylonicus* Sharp; *P. cerylonoides* Reitter; *P. clypealis* (Slipinski); *P. conicicollis* (Reitter); *P. curtipes* (Sharp); *P. crenatus* Dajoz; *P. curticornis* (Dajoz); *P. dentatus* Dajoz; *P. dentipes* Slipinski; *P. depressus* Sharp; *P. diota* n. nov.; *P. distinctus* Slipinski; *P. elephant* (Slipinski); *P. elongatus* Nakane; *P. exaratus* (Chevrolat)(*Pycnomerus*); *P. evanescens* (Reitter); *P. floridensis* (Sen Gupta and Crowson); *P. franzi* (Dajoz); *P. gardineri* (Grouvelle); *P. glabriculus* LeConte; *P. griveaudi* Dajoz; *P. guadaloupensis* Grouvelle; *P. heinzei* n. nov.; *P. humeralis* (Grouvelle); *P. humilis* (Pascoe); *P. infimus* (Grouvelle); *P. insularis* (Grouvelle); *P. intermedius* (Slipinski); *P. jamaicensis* (Dajoz); *P. japonicus* Slipinski; *P. jeanneli* (Dajoz); *P. kingsolveri* Slipinski; *P. korschewskyi* Heinze; *P. lanuginosus* (Grouvelle); *P. liliputanus* (Grouvelle); *P. longius* (Grouvelle); *P. macrose-tosus* Slipinski; *P. madagascariensis* (Grouvelle); *P. magnicollis* (Reit-ter); *P. major* Grouvelle; *P. malgasz* n. nov.; *P. margaretae* Slipinski; *P. marginatus* Sharp; *P. mexicanus* (Slipinski); *P. microphthalmus* (Dajoz); *P. microsetosus* Slipinski; *P. micrus* Slipinski; *P. misellus* n. nov.; *P. montandoni* Aubé; *P. newtoni* Slipinski; *P. nepalensis* Dajoz; *P. nguembae* (Dajoz); *P. nitidus* Sharp; *P. nominatus* n. nov.; *P. norfolkiensis* Slipinski; *P. notabilis* Broun; *P. ocellatus* (Slipinski); *P. occidentalis* Lawrence and Stephan; *P. oculatus* Slipinski; *P. parviceps* (Carter and Zeck); *P. pallipes* n. nov.; *P. pauliani* Dajoz; *P. perparvulus* (Grouvelle); *P. perrieri* (Grouvelle); *P. peruvianus* (Dajoz); *P. peruanus* Slipinski; *P. peyrierasi* (Dajoz); *P. pleuralis* (Slipinski); *P. politulus*

Sharp; *P. pubens* Sharp; *P. puberulus* Schwarz; *P. reticulatus* Dajoz; *P. rotundicollis* (Grouvelle); *P. rotundus* Slipinski; *P. sculpturatus* Dajoz; *P. seminigiger* Grouvelle; *P. semistriatus* (Perris); *P. similis* Dajoz; *P. setosus* (Sharp); *P. sikorai* (Grouvelle); *P. solidus* (Grouvelle); *P. tantillus* (Grouvelle); *P. tasmanicus* Slipinski; *P. testaceus* Dajoz; *P. thoracicus* Dajoz; *P. viettei* (Dajoz).

New names are: *P. bafut* n. nov. for *P. microphthalmus* (Dajoz, 1978) (*Batufia*) nec *P. microphthalmus* (Dajoz, 1974a) (*Kenyalon*); *P. diota* n. nov. for *P. ocellatus* (Slipinski, 1982c) (*Cerylcautomus*) nec *P. ocellatus* Slipinski, 1981a; *P. heinzei* n. nov. for *P. cerylonoides* (Heinze, 1944a) (*Cautomus*) nec *P. cerylonoides* Reitter, 1876b; *P. malgasz* n. nov. for *P. madagascariensis* (Dajoz, 1980) (*Pologlyptus*) nec *P. madagascariensis* (Grouvelle, 1899) (*Cerylon*); *P. misellus* n. nov. for *P. marginatus* (Grouvelle, 1899) (*Cerylon*) nec *P. marginatus* Sharp, 1895; *P. nominatus* n. nov. for *P. peyrierasi* (Dajoz, 1980) (*Madacerylon*) nec *P. peyrierasi* (Dajoz, 1980) (*Pologlyptus*); *P. pallipes* n. nov. for *P. major* (Slipinski, 1982c) (*Cerylcautomus*) nec *P. major* Grouvelle, 1898b.

Discussion - The genus *Philothermus*, as used here, is the largest genus of the family and includes about 80 species from all over the world, including four European species previously placed in *Cerylon* or *Pseudophilothermus*. The genus includes most of the species previously placed in *Cerylon* that have the prosternal process parallel-sided, procoxal cavities externally open or narrowly closed by the lateral notal projections; protibia obtusely rounded at outer-apical angle, and aedeagus with well-developed tegmen bearing setose parameres. I have synonymized here several genera established by Dajoz, that are based, in my opinion, on insufficient characters to create genera. Some of these genera (*Comalon*, *Pologlyptus*, *Kenyalon*, *Caecodium*, *Batufia*, *Madacerylon*) are described from single specimens or their types were not found in Paris, therefore their status is not fully resolved. I was able to examine specimens of *Batufia microphthalmus*, *Caecodium franzi* and *Pologlyptus peyrieasi* and from external examination of these specimens there is little doubt they should be included in *Philothermus*. Dajoz's statement about 12-segmented antenna in *Pologlyptus* is incorrect; the antenna is 10-segmented with the club bearing two rings of setae giving the appearance of additional divisions. There is no doubt that *Comalon* is an apterous and blind *Philothermus* since several very closely related species occur in the Ecuador-Colombia-Peru region, although I have not seen the type of

this species, since it is missing from the Paris Museum collections. The status of *Cerylcautomus* is less certain, it includes most specialized forms of the *Philothermus* lineage with mouthparts of piercing-type, prosternum with clear cavities anteriorly, and median lobe with specialized shape and ornaments. On the other hand large numbers of *Philothermus* examined yielded many transitional forms between typical *Philothermus* and *Cerylcautomus*, including all possible forms of mouthparts elongation and development of the antennal cavities on the prosternum. A supposed larva of *Cerylcautomus floridensis*, collected with many adults at the type-locality, does not show any generic characters, and is similar to both *Philothermus* and *Mychocerus*. Therefore, I consider both of these genera synonymous, but more extensive study of larval and adult stages of many more species may show that this genus is paraphyletic. So far, I could not detect any synapomorphies for this group. The systematic position of *Philothermus* is not clear, and it may be related to *Ectomicrus*, *Ploesoma*, *Pathelus*, and *Orientrylon*, with *Philothermus* being a possible sister-group of all of them.

Ectomicrus Sharp

Ectomicrus Sharp, 1885a: 78. Type species, by original designation, *Ectomicrus rugicollis* Sharp, 1885a.

Grouvelleia Dajoz, 1975b: 1063. Type species, by original designation, *Grouvelleia denticollis* Dajoz, 1975b. - Synonymized by Slipinski 1985a: 616. - Sharp 1885b.

Diagnostic combination - Length 2.1-3.2 mm; moderately elongate to broadly oval (fig. 83A); usually strongly convex; rarely winged; dorsum sparsely setose. **HEAD**: mouthparts of elongate-type but not of piercing-type (fig. 83B, E, G); antenna 10-segmented with 1-segmented club (fig. 83D), very rarely 11-segmented with 2-segmented club. **PROTHORAX** never clearly margined laterally, the edges crenulate; disk always coarsely punctured, punctures coarse and contiguous, each bearing setiferous tubercle (fig. 18A); prosternal process parallel-sided; coxal acvities externally open, rarely narrowly closed externally by the notal projections. Mesosternal process narrow; metasternum and ventrite I without femoral lines. **LEGS**: tarsi 4-4-4, protibia obtusely rounded at outer-apical angle; empodium present. **ELYTRA** with 8 rows of coarse punctures; intervals often weakly convex; 8th interval forming lateral edge of elytron and partially downturned forming a pseudopipleuron, epipleura proper narrow and

almost complete. AEDEAGUS with well-developed tegmen, median lobe (fig. 83F) with simple ornamentation; tegmen with ventral ring and sparsely setose parameres (fig. 83H). No external differences between sexes.

Immature stages - Unknown.

Biology - Most of the recently collected specimens are from leaf and forest litter.

Distribution - South India (Kerala); Sri Lanka; Indonesia (Sumatra); Malaysia (Sabah, Sarawak); Japan; Taiwan.

Species included - *E. aper* Sharp; *E. denticollis* (Dajoz); *E. rugicollis* Sharp; *E. variolosus* (Hinton).

Discussion - *Ectomicrus* is closely related to *Philothermus* because of its open or narrowly closed procoxal cavities, protibia rounded at outer-apical angle, and aedeagus with well-developed tegmen. Some species of *Orientrylon* (mostly from northern and southern India) are also similar to *Ectomicrus* but are immediately recognized having the protibia with a distinct tooth at outer-apical angle and the tegmen asymmetrical. The systematic position and taxonomic status of *Ectomicrus* are unclear. It is retained here as an independent genus because of the peculiar form the 8th elytral interval forming an apparent pseudopipleuron and the highly specialized structure of the pronotal surface with flat-bottomed punctures bearing a median setigerous tubercle. This is not seen in other genera of Cerylonidae except for *Gyreleon*.

Pakalukia gen. n.

Type species: *Pakalukia napo* sp. n.

Gender: Feminine.

Etymology: Dedicated to my colleague Jim Pakaluk of the University of Kansas, Lawrence, USA, who brought this interesting beetle to my attention.

Diagnostic combination - Length 2.6-3.5 mm; broadly oval (fig. 44) convex; winged; densely pilose. HEAD with large, finely faceted eyes; antenna 11-segmented with 3-segmented club (fig. 84F); mouthparts of normal type (fig. 84C, E), prementum multisetose (fig. 84E). PROTHORAX transverse with sides arcuate and margins weakly crenulate, sides slightly upturned and widely margined; pronotal disk with characteristic pattern of lateral coarse punctures and almost smooth median basal part separated from the antero--median, punctate region by transverse keel (fig. 44); prosternum

without antennal grooves or cavities; prosternal process about $2 \times$ as wide as coxa, parallel-sided; cavities externally and internally open (fig. 84A). Mesocoxal process about $0.7 \times$ as wide as coxa, flat; metasternum and ventrite I without femoral lines, metasternum with median impressed line near base (fig. 84B). LEGS slender; protibia rounded apically; tarsi 4-4-4, tarsomeres simple; empodium present. ELYTRA with 8 rows of regular punctures, rows often confused; epipleura wide, incomplete at extreme tip. WING without anal veins. AEDEAGUS (fig. 84D) without tegmen, median lobe simple, moderately sclerotized. Ovipositor not examined. Sexual characters: males with last abdominal ventrite densely setose, female ventrites almost smooth.

Immature stages - Unknown.

Biology - Adults have been extracted from leaf and log litter, and from fermenting stump pulp.

Distribution - Panama (Chiriqui); Equador (Napó); Peru (Cuzco).

Species included - *P. napo* sp. n.

Discussion - This is a very distinctive genus because of its 11-segmented antennae with well separated 3-segmented club, the prosternum not elevated antero-medially and without antennal cavities, the aedeagal tegmen obsolete and the elytral intervals flat. The form of prosternum, the elytra without raised intervals and the obsolete tegmen will distinguish it from the other New World genus *Glyptolopus*. *Coccilon*, known only from the Oriental Region, has also the antennal club weakly 3-segmented but its cassidid-facies and glabrous dorsum distinguish it at once from *Pakalukia*. Possible relationships with other genera are problematic since the apomorphic characters, like the absence of the tegmen, crenulate and upturned pronotal margins, and transverse glabrous slat (keel) on the posterior part of pronotum, could have been derived independently in Ceryloninae many times. The antenna with 3-segmented club, large size and the Neotropical distribution suggest the affinity with *Glyptolopus* that could have been derived from *Pakalukia*-like ancestors, in this case the reduction of the tegmen in *Pakalukia* would be an apomorphic character in relation to *Glyptolopus* that retained a well-developed and complex tegmen.

Pakalukia n a p o sp. n.

Length 2.6-3.5 mm. Brown to dark brown; dorsal surface shiny; vestiture consists of dense yellowish hairs about as long as the last antennomere, distinctly visible at $10 \times$ magnification. Head transverse; clypeus setose, truncate anteriorly. Antenna as in fig. 84F, antennomere III in male longer than in female; disk densely punctate and setose except for narrow median region that is impunctate. Pronotum 0.5-0.6 times as long as wide, widest behind middle; anterior margin deeply emarginate, unbordered; lateral margins arcuate and widely bordered, the edges crenulate; base lobed medially and deeply situate laterally, unbordered; disk with large and deep, densely punctate subbasal impressions continuing anteriorly along margins as impressed rows of coarse punctures; transverse slit distinct, darker than the remaining disk surface, surface immediately behind it densely setose. Scutellum triangular, minute. Elytra as long as wide and $2.3-2.4 \times$ as long as pronotum; margins narrow but visible in basal $4/5$; elytral punctures slightly confused, the punctures about 1-2 diameters apart; intervals micropunctured and densely setose. Aedeagus as in fig. 84D.

HOLOTYPE (male): ECUADOR, Napo, 24 km N Baeza, 1000m, 4.III.1976, J.M. Campbell (CNC);

PARATYPES, ECUADOR Napo, Limoncocha, 28.VI.1976, 250m, berl. 349, S. & J. Peck, fermenting stump pulp (2, CNC; 1, IZPAN); PERU, Cuzco Dept., Consuelo, Manu rd. 165 km, 5.X.1982, FMNH 82-343, ex rotten palm, L.E. Watrous & G. Mazurek (5, FMNH); same locality and collectors with various dates from 3-12.X, and lots 82-328 to 82-375, leaf litter, flight intercept trap, beating dead palm branches, total 40 paratypes (FMNH, MSNG, IZPAN).

Glyptolopus Erichson

Glyptolopus Erichson, 1845: 292. Type species, by subsequent monotypy, *Glyptolopus histeroides* Pascoe, 1860. - Dajoz 1979a: 185-186; Besuchet and Slipinski 1987 (revision of the genus).

Diagnostic combination - Length 3.8-4.6 mm; elongate to broadly-oval; convex; winged; dorsum sparsely and shortly setose. HEAD with occipital ridge feebly visible; antenna 11-segmented with large 3-segmented club (fig. 85A) often antennomeres VI, VII transverse forming an apparent club composed of 4-5 segments; mouthparts elongate but not of piercing-type (fig. 85C, D, 86A, B),

prementum with four setae arranged as in fig. 86B. PROTHORAX convex medially with sides explanate and margins upturned; disk with two admedial and two sublateral incomplete carinae (fig. 45); prosternum strongly elevated anteromedially but without clearly delimited antennal cavities (fig. 85E); prosternal process parallel-sided; coxal cavities externally and internally open. Mesosternum about $0.5 \times$ as wide as coxa; metasternum and ventrite I without femoral lines (fig. 85F). LEGS stout; tibiae irregular at outer margins, often with weak longitudinal carinae on both sides; protibia rounded at outer-apical angle; tarsi 4-4-4, tarsomeres simple; empodium present. ELYTRA with 9 rows of punctures; intervals 3, 5, 7 and 9 costate; epipleura wide from base to level of metacoxa then abruptly narrowing apically, not dentate. Scutellum triangular or pentagonal, visible. AEDEAGUS with well-developed tegmen: median lobe without internal ornamentation, simple (fig. 86E); tegmen with fused unisetose parameres (fig. 86C, D). Sexual characters: males can easily be recognized in having tarsomere IV of protarsi with strong tooth (fig. 85B).

Immature stages - Unknown.

Biology - Unknown.

Distribution - The Amazonian region of South America.

Species included - *G. amazonicus* Besuchet and Slipinski, *G. convexus* Besuchet and Slipinski, *G. dentatus* Dajoz, *G. histeroides* Pascoe; *G. quadricostatus* Heinze.

Discussion - The toothed fourth tarsomere of the male protarsi seems to be the only synapomorphy for this genus. The raised prosternum, costate intervals and coarsely punctate pronotum are shared with other genera. The pronotal ornamentation (with two rows of tubercles) could also be taken as a synapomorphy for this genus. See also *Pakalukia* for discussion (p. 98).

Ploeosoma Wollaston

Ploeosoma Wollaston, 1854: 147. Type species, by monotypy, *Ploeosoma ellipticum* Wollaston, 1854.

— Sen Gupta and Crowson, 1973: 415.

Diagnostic combination - Length 2.0-2.2 mm; body elongate-oval; convex; wingless; dorsum almost glabrous. HEAD: eyes small, prominent; antenna 10-segmented with 1-segmented club (fig. 87D), antennomere III about $1.5 \times$ as long as IV; mouthparts of

normal type, prementum with four setae arranged as in fig. 87B. PROTHORAX narrowing anteriorly, widest at base; lateral edges smooth, marginal line narrow, entire; prosternum raised medially (fig. 87A) but without antennal cavities; prosternal process expanded apically, about $2 \times$ as wide as coxa; procoxal cavities closed externally, open internally. Mesocoxal process $1.3 \times$ as wide as coxa; metasternum and abdominal ventrite I without femoral lines. LEGS: tarsi 4-4-4; protibia rounded apically (fig. 87C); empodium present. AEDEAGUS: median lobe simple, without ornamentation (fig. 87E); tegmen well-developed, parameres multisetose (fig. 87F). Ovipositor about $0.5 \times$ as wide as abdomen, spermathecal gland long and spiral. No external differences between sexes.

Immature stages - Unknown.

Biology - Adults were collected from leaf and forest litter.

Distribution - Endemic to Madeira.

Species included - *P. ellipticum* Wollaston.

Discussion - This monotypic genus is an apparently derived form from the *Philothermus* stock because of its tegmen with well-developed parameres, the median lobe without rich internal ornamentation, the protibia obtusely rounded at outer-apical angle and 4-segmented tarsi. The apomorphic characters in relation to *Philothermus* include the prosternal process strongly expanded apically, the procoxal cavities widely closed behind and the prosternum with an antero-medial keel. HINTON (1942a) synonymized *Ploeosoma* with *Cerylon* because of the procoxal closure and 10-segmented antennae. DAJOZ (1976a) restored the genus because of «body form, especially of prothorax, form of process and lack of wings.». This curious statement does not justify the generic statement of *Ploeosoma*, though because of the characters mentioned above the single Madeiran species deserves generic status. It is far distant from *Cerylon* that has protibia dentate at outer-apical angle, the ligula not expanded laterally and the tegmen obsolete.

Coccilon Hinton

Coccilon Hinton, 1942a: 152. Type species, by original designation, *Coccilon charon* Hinton, 1942a.

Diagnostic combination - Length 2.3-2.8 mm; body broadly-oval, flattened; wingless; glabrous. HEAD almost completely concealed by pronotum; antenna 11-segmented with club not di-

stinctly 3-segmented (fig. 88C), antennomeres II-IX elongate; mouthparts of normal type (fig. 88E), prementum bearing four setae arranged as in fig. 88A. Prothorax very characteristic (fig. 88B) with lateral sides strongly explanate and margins not visible from above; prosternum without antennal grooves or cavities; prosternal process about as wide as coxa, slightly widened apically; coxal cavities externally open. Mesosternal process about $0.8 \times$ as wide as coxa; metasternum about $0.8 \times$ as long as ventrite I, both without femoral lines. LEGS: femora swollen; protibia rounded apically; tarsi 4-4-4, tarsomeres simple; empodium present. ELYTRA with 9 rows of fine punctures; intervals flat; epipleura wide, complete; scutellum triangular, large. AEDEAGUS (fig. 88D) with median lobe sclerotized and without internal ornamentation; tegmen strongly reduced to a ring-like structure. Ovipositor not examined. No apparent sexual characters observed.

Immature stages - Unknown.

Biology - Unknown.

Distribution - Known only from Indonesia (Sumatra) and Malaysia (Sarawak).

Species included - *C. charon* Hinton.

Discussion - The strongly explanate sides of the prothorax and elytra are unique for this genus. The systematic position of *Coccilon* is unclear with a possible link to *Philothermus* because the median lobe is simple, protibia are rounded apically, prosternal process is narrow and parallel-sided, and antenna is 11-segmented with well-divided antennal club. The reduced tegmen and the explanate margins would constitute apomorphies in relation to *Philothermus*.

Pathelus Dajoz

Praslinia Dajoz, 1974c: 116. Type species, by original designation, *Praslinia peyrierasi* Dajoz, 1974c nec *Praslinia* Boulenger, 1909: 292 [Amphibia, Gymnophiona].

Pathelus Dajoz, 1974a: 27. Type species, by original designation, *Pathelus borbonicus* Dajoz, 1974a.

Solumia Dajoz, 1980: 195. Type species, by original designation, *Solumia alluaudi* Dajoz, 1980. **Syn. n.**

As Slipinski, 1982a: 220. Type species, by original designation, *As alae* Slipinski, 1982a. **Syn. n.**

Illerylon Slipinski, 1982a: 221. Type species, by original designation, *Illerylon besucheti* Slipinski, 1982a. - Synonymized with *Solumia* Dajoz by Slipinski, 1984: 97

Praslirylon Nussbaum and Slipinski in SLIPINSKI, 1985a: 615 [new name for *Praslinia* Dajoz]. **Syn. n.**

Diagnostic combination - Length 1.2-2.2 mm; elongate-oval to oval; convex; usually wingless; dorsum usually glabrous, rarely microsetose. **HEAD** with occipital ridge very fine or obsolete; eyes variable, usually small and prominent; antenna 9-11-segmented with 1-2 segmented club (fig. 89E, F); mouthparts of slightly elongate type (fig. 89B, H), prementum with four setae arranged as in fig. 89B. **PROTHORAX** usually widest near base, arcuate, narrowing anteriorly, sides narrowly margined, edges smooth; prosternum with shallow antennal cavities in lateral portions (fig. 89A), anterior margin weakly emarginate to receive antenna when retracted; prosternal process about as wide as coxa, parallel-sided; coxal cavities externally open. Mesosternum $0.6-1.1 \times$ as wide as coxa (fig. 89C), flat; metasternum and ventrite I without femoral lines. **LEGS**: protibia rounded at outer-apical angle; tarsi 4-4-4; empodium present. **ELYTRA** almost smooth, rarely with irregular punctures; epipleura narrow, incomplete apically. **AEDEAGUS** (fig. 89D, I) with median lobe simple, tegmen bearing ventral ring. No external differences between sexes.

Immature stages - Unknown.

Biology - Extracted from leaf litter.

Distribution - Comoro, Mascarene and Seychelles Islands.

Species included - *P. alae* (Slipinski); *P. alluaudi* (Dajoz); *P. besucheti* (Slipinski); *P. borbonicus* Dajoz; *P. curtulus* (Grouvelle); *P. mauritanus* Slipinski; *P. loebli* Slipinski; *P. peyrrierasi* (Dajoz);

Discussion - *Pathelus*, contains 8 described and 3-4 undescribed insular species found exclusively in the Comoro, Mascarene or Seychelles Islands that share well-developed antennal cavities on the prosternum, obtusely rounded protibia, dorsum glabrous, tegmen well-developed with setose parameres, and tetramerous tarsi. Most of the characters listed above, except for the antennal cavities, are probably plesiomorphies and are shared with *Philothermus*. As discussed under *Philothermus*, there are some species in the West Indies and Florida with antennal cavities as well, but because of the aedeagal structures they seem to be derived from the New World not the Old World line. I think the cavities are derived independently in some *Philothermus* and *Pathelus*. In spite of a close relationship between *Philothermus* and *Pathelus*, the latter is retained as an independent

genus because the cavities are well defined, the dorsum is glabrous and the spermatheca has a specialized accessory gland (not found so far in *Philothermus*). After re-examining all available material of Ceryloninae I have decided that the mesosternal structure (considered important in my previous papers), i.e. the separation of the mesocoxae, varies to a large extent and depends mostly on the general body construction. In globular and usually oval species the mesosternum is usually wider than in moderately convex and more parallel-sided forms. This is the reason I have synonymized *As* and *Solumia* with both *Pathelus* and *Praslirylon* (perviously placed in two different tribes by me in 1984). The Seychelles species, *P. peyrrierasi*, presents the extreme reduction of the antennomeres (9-segmented with 1-segmented club), eyes (single ommatidium), wings and mesocoxal distance (almost contiguous), but otherwise has all diagnostic features of *Pathelus*. I think the ultimate decision concerning the taxonomic status of the *Philothermus-Pathelus-Cerylcautomus* complex could not be made before more larvae of critical taxa are known.

Ellipsorylon gen. n.

Type species: *Cerylon ellipsoideus* Pope, 1962.

Gender: Masculine.

Etymology: This is a combination of a prefix Ellipso- with the name *Cerylon* referring to the broadly oval, elliptical body and a similarity to *Cerylon* of the only known species.

Diagnostic combination - Length 1.5-2.1 mm; broadly-oval; convex; winged; dorsum densely setose. HEAD: eyes small and prominent; antenna 11-segmented with 2-segmented (fig. 90C), antennomere III about $2.5 \times$ as long as IV; mouthparts of normal type (fig. 90B, E, I), prementum bearing four long setae arranged as in fig. 90E. PROTHORAX widest at base, narrowing anteriorly; prosternum keeled anteriorly; prosternal process widened apically and deeply notched medially (fig. 90A); coxal cavities externally closed. Mesosternum carinate anteromedially (fig. 90D) to fit into the notch in the prosternal process; metasternum with vestigial femoral lines; ventrite I without femoral lines. LEGS: tarsi 4-4-4; protibia rounded apically (fig. 90H); empodium present. ELYTRA with 8 rows of striae punctures; intervals flat; epipleura incomplete in apical $1/2$; scutellum large, triangular. AEDEAGUS: median lobe simple, with 2 anal internal

sclerites (fig. 90F); tegmen with ventral ring and parameres sparsely setose (fig. 90G). No external differences between sexes.

Immature stages - Unknown.

Biology - Adults have been extracted from leaf and forest litter.

Distribution - Eastern Africa (Kenya, Rwanda, Zaire: Ruwenzori Mt.).

Species included - *E. ellipsoideus* (Pope).

Discussion - This monotypic genus closely resembles some African species of *Philothermus* but differs by its prosternal process expanded and deeply notched apically, mesosternum carinate, and metasternum with vestigial femoral lines. *Philothermus* seems to be closely related to *Ellipsorylon*, but their shared characters seem to be plesiomorphies (obtusely rounded protibia, tegmen well-developed and with ventral ring-like structure, antenna with 2-segmented club). If *Ellipsorylon* is a derived form from *Philothermus*-like ancestors, then the femoral lines on the metasternum should be postulated as a synapomorphy (they are never present in *Philothermus*).

Acautomus Heinze

Acautomus Heinze, 1944a: 31. Type species, by original designation, *Cautomus armatus* Grouvelle, 1906: 115. - Sen Gupta and Crowson 1973: 438.

Diagnostic combination - Length 2.8-4.1 mm; body narrowly-elongate; moderately convex; winged; dorsum almost dull, shortly and sparsely setose. HEAD: eyes moderately large; antenna 11-segmented with indistinctly 2-segmented club (fig. 91B), antennomere III 1.5-1.7 \times as wide as IV; mouthparts of slightly elongate type (fig. 91C), prementum with four long setae arranged as in fig. 91E. PROTHORAX widest at middle, narrowing arcuately towards base and apex, margins crenulate or serrate; disk densely and coarsely punctate, usually paramarginal raised carinae visible; prosternum raised medially (fig. 91A) but without clearly marked antennal grooves or cavities; prosternal process about as wide as coxa, slightly widened apically; cavities narrowly closed externally, internally open. Mesosternal process about 0.5 \times as wide as coxa; metasternum and ventrite I without femoral lines. LEGS: tarsi 4-4-4; tarsomeres simple; empodium present; protibia rounded apically; meso- and metafemora often with strong tooth at inner margin (fig. 91D, E). ELYTRA with

9 rows of stria punctures; intervals weakly convex and granulose; epipleura narrow, incomplete apically; scutellum large, triangular. AEDEAGUS (fig. 91G, H) with median lobe curved, heavily sclerotized, with median ornamentation; parameres setose. Ovipositor similar to *Cerylon*. Sexual characters: males are recognized by the clypeus being more deeply and widely emarginate anteriorly, last ventrite with shallow depression and the teeth on meso- and metafemora more strongly prominent.

Immature stages - Unknown.

Biology - Unknown.

Distribution - Endemic to Madagascar.

Species included - *A. armatus* (Grouvelle); *A. ineditus* Dajoz.

Discussion - This genus is superficially similar to *Cautomus* because of its prosternum raised antero-medially, the elongate mouthparts, and the pronotal sides crenulate. It is distinguished from *Cautomus* by the antennal club without sensory appendages, the elytral intervals weakly raised and at least the metafemora with inner tooth. The systematic position of this genus is uncertain. The dentate femora, the submarginal pronotal carinae and the raised elytra intervals constitute synapomorphies for both species of this genus.

Spinocerylon Slipinski

Spinocerylon Slipinski, 1988c: 483. Type species, by original designation, *Spinocerylon apterus* Slipinski, 1988c. - Slipinski 1981c: 428-430 (*mirabilis* group)

Diagnostic combination - Length 2.0-3.0 mm; elongate, usually parallel-sided (fig. 92C); flat or weakly convex; usually winged; glabrous. HEAD: eyes large or reduced; antenna 10-11-segmented with 1-2-segmented club, antennomeres elongate, never transverse; mouthparts of normal type (fig. 92B, I, J), prementum with 4 setae arranged as in fig. 92I. PROTHORAX narrowing posteriorly, without antennal cavities; prosternal process parallel-sided in basal 2/3 then abruptly widened apically (fig. 92A); coxal cavities broadly closed externally, partially closed internally, Mesosternal process about as wide as coxa; metasternum and ventrite I without femoral lines. LEGS: tibiae widened apically, usually with sexual characters; protibia rounded or obtusely angled at outer-apical angle; tarsi 4-4-4; empodium present. ELYTRA with 5-8 rows of stria

punctures, intervals flat; epipleura narrow and incomplete apically. AEDEAGUS with tegmen almost complete and complex (fig. 92H); median lobe (fig. 92D) with unusually long basal piece and simple internal ornamentation. Sexual characters: Males can be recognized by the spines on the inner-apical margins of the tibiae (fig. 92C, E) and the usually arcuate or emarginate inner margins of the hind tibiae.

Immature stages - Unknown.

Biology - Adult were collected from leaf and forest litter at higher elevations.

Distribution - Northern Pakistan; northern India (Kashmir, Himachal Pradesh); southern India (Madura); Nepal; Sri Lanka; northern Thailand; Malaysia (Pahang); Philippines (Mindanao); Papua New Guinea.

Species included - *S. apterus* Slipinski, *S. mirabilis* (Slipinski) and *S. wittmeri* (Slipinski).

Discussion - This genus is a distinctive group sharing a peculiar form of the median lobe (with long basal piece), spinose tibiae in males, and elongate antennomeres in both sexes. The well-developed tegmen with complex and setose parameres, prosternal process gradually and markedly expanded apically with the cavities widely closed posteriorly, and obtusely rounded protibia will immediately distinguish it from *Cerylon*, *Paracerylon* and *Orientrylon*. The form of the prosternal process and the widely closed cavities distinguish it from otherwise similar *Philothermus*. So far (except for the highly aberrant *P. carinatus*) no *Philothermus* is known with sexual characters similar to *Spinocerylon*.

Gyreleon Hinton

Gyreleon Hinton, 1942a: 146. Type species, by original designation, *Gyreleon mila* Hinton, 1942a. - Sen Gupta and Crowson 1973: 418.

Diagnostic combination - Length 2.8-3.5 mm; broadly-oval; convex; sparsely but distinctly setose (fig. 46); winged. HEAD: eyes large, coarsely faceted; antenna 10-11-segmented with club 2- or rarely 1-segmented (fig. 46), antennomere III as long as IV; mouthparts similar to *Pseudocerylon*, normal type, prementum heavily sclerotized with 4 setae on each side (fig. 93J). PROTHORAX usually cordiform, narrowing posteriorly, coarsely and densely punctured, punctures subcontiguous, setiferous; the edges crenulate not margined;

prosternal process about $1.2 \times$ as wide as coxa, tridentate apically, the median tooth being higher and produced forwardly leaving emargination to receive mesosternal process (fig. 13A, 93H). Mesosternum (fig. 93I) with strong, apically rounded or almost acute process; metasternum and ventrite I without femoral lines. LEGS stout; femora not swollen medially; tibiae crenulate or irregular at outer margins, protibia rounded at outer-apical angle; tarsi 4-4-4, tarsomere I weakly lobed below (fig. 93F); empodium present; ELYTRA with 9 rows of coarse often slightly transverse or irregular punctures; intervals often weakly convex or nodulose; epipleura narrow, incomplete. Scutellum triangular, large. AEDEAGUS (fig. 93G) without tegmen; median lobe simple, weakly sclerotized. Ovipositor and spiculum gastrale extremely long (as long as abdomen). Sexual characters: males have the anterior clypeal margin more strongly and widely emarginate medially.

Immature stages - Unknown.

Biology - Frequently collected from forest and leaf litter.

Distribution - Southern China (Fukien); northern Thailand; Malaysia (Sarawak, Sabah); Indonesia (Sumatra, Java).

Species included - *G. compactus* (Dajoz); *G. mila* Hinton; *G. sumatrensis* Dajoz; *G. rugosus* (Slipinski).

Discussion - The structure of the prosternal and mesosternal processes, lobed tarsomere I and form of the antennal grooves on the prosternum are uniquely derived characters for this genus. The systematic position of this genus is unclear. *Gyreleon* shares with *Pseudocerylon* the robust body form, stout antennae, and obsolete tegmen, but those similarities are probably convergences due to their similar habitat.

Clavicerylon gen. n.

Type species: *Cerylon sumatrensis* Dajoz, 1975b.

Gender: Masculine.

Etymology: A combination of a prefix clavi- with the classical name *Cerylon* referring to a stout and clavate antenna and overall similarity with *Cerylon*.

Diagnostic combination - Length 1.8-2.9 mm; elongate to broadly-oval; convex; winged; setae moderately long but dense. HEAD: eyes large and often coarsely faceted; antenna 11-segmented, stout, with 2-segmented club (fig. 94D); mouthparts of normal type (fig. 94B, E, F), prementum heavily sclerotized and multisetose (fig.

94B). PROTHORAX slightly cordiform, margins not visible from above; pronotal disk convex medially with lateral parts coarsely and densely punctate, median region almost smooth; prosternum without antennal cavities; prosternal process 1.0-1.3 \times as wide as coxa, abruptly expanded apically (fig. 94A) and concave; coxal cavities externally closed, internally partially closed. Mesosternal process about 0.8 \times as wide as coxa, strongly prominent to fit into a concavity of the prosternal process (fig. 94C); metasternum and ventrite I without femoral lines. LEGS: tarsi 4-4-4, tarsomeres simple; empodium present; protibia with tooth at outer-apical angle (fig. 94G). ELYTRA with 8 rows; epipleura abruptly narrowing at level of metacoxae, incomplete apically. AEDEAGUS (fig. 94H) with median lobe strongly sclerotized, with complex internal structure; tegmen absent. Sexual characters: males can be distinguished from females by having the clypeus more strongly emarginate.

Immature stages - Unknown.

Biology - Most of the specimens have been extracted from forest and log litter.

Distribution - Indonesia (Java, Sumatra, Kalimantan); Malaysia (Pahang, Sabah, Sarawak); Philippines (Mindoro).

Species included - *C. sumatrensis* (Dajoz).

Discussion - This genus is well characterized by its compact and dorsally setose body, stout and clavate antennae, peculiar mesosternal process fitting into a concavity of the prosternal process, protibia bearing distinct tooth at outer-apical angle, and tegmen obsolete. The mesosternal process will distinguish it from *Paracerylon* and *Cerylon*, and the former constitutes its possible closest relative.

Pachylon Sharp

Pachylon Sharp, 1885a: 79. Type species, by monotypy, *Pachylon gorhami* Sharp, 1885a. - Sen Gupta and Crowson 1973: 418.

Diagnostic combination - Length 5-8 mm; body elongate-oval; subdepressed; glabrous; winged. HEAD: eyes moderately large, finely faceted; antenna 10-segmented with 1-segmented club (fig. 93D), antennomere III about 1.2-1.4 \times as long as IV; mouthparts of normal type, labrum shallowly emarginate apically, mandible broad and unidentate apically, maxillary galea and lacinia broad and densely

hairy, prementum with setae arranged as in fig. 93A. PROTHORAX cordiform (fig. 47); lateral margins not visible from above; prosternal process (fig. 93B) about $0.7 \times$ as wide as coxa, abruptly widened at apex; coxal cavities externally closed; sternopleural sutures complete. Mesosternal process $0.5 \times$ as wide as coxa, flat; metasternum and ventrite I without femoral lines. LEGS: tarsi 4-4-4; empodium present; protibia dentate at outer-apical angle (fig. 93C). ELYTRA with 6 rows of stria punctures; intervals flat; epipleura narrow and incomplete apically. AEDEAGUS (fig. 93E) with median lobe simple, without internal ornamentation, tegmen reduced to a ring-like basal piece. No external differences between sexes.

Immature stages - Unknown.

Biology - Unknown.

Distribution - India (Andaman Islands); Indonesia (Sumatra); Malaysia (Selangor, Sarawak).

Species included - *P. gestroi* Grouvelle; *P. gorhami* Sharp.

Discussion - Specimens of this genus are the largest known cerylonids and are characterized by their pronotum being cordiform and narrowing towards base, protibia dentate at outer-apical angle, median lobe simple and tegmen strongly reduced to a ring-like basal piece, and no antennal grooves or cavities on the prothorax. The systematic position of *Pachylon* is unclear; it may represent an early offshoot of the *Paracerylon*-*Cerylon* line as suggested by the reduced tegmen and dentate protibia.

Oroussetia Dajoz

Oroussetia Dajoz, 1981a: 61. Type species, by original designation, *Oroussetia punctata* Dajoz, 1981a.

Diagnostic combination - Length 1.6-2.8 mm; elongate-oval to broadly-oval; convex; usually wingless; vestiture of dorsum consists of moderately long to long hairs or setae, sometimes pubescence double. HEAD: eyes moderately large to reduced, coarsely faceted; temples always well marked; antenna stout, 11-segmented with 2-segmented, distinctly divided club (fig. 95D), antennomere III about as long as IV, scape very stout; mouth cavity on the ventral side with a long acute process on each side (fig. 95C); mouthparts of normal type, labium with prementum bearing four setae arranged

as in fig. 95G. PROTHORAX usually cordiform with setae (fig. 95A), narrowing basally, the lateral edges crenulate to serrate; prosternal process almost as wide as coxa, weakly expanded apically; coxal cavities broadly closed posteriorly, almost closed internally (fig. 95B). Mesosternal process about $0.6 \times$ as wide as coxa, often convex; metasternum and ventrite I without femoral lines. LEGS: tarsi 4-4-4, tarsomere I rarely widened or lobed; empodium present; protibia obtusely rounded at outer-apical angle. ELYTRA with 8 rows of striae punctures; epipleura narrow and incomplete apically; scutellum triangular. WING without anal veins. AEDEAGUS without tegmen; median lobe (fig. 95E) of characteristic shape, weakly sclerotized and without internal ornamentation. Ovipositor long; spermathecal gland large and spiral-shaped. Sexual characters: in two species from the Philippine Islands male protarsi have tarsomere I dilated and lobed below (fig. 95F); in other known species there are no differences between sexes.

Immature stages - Unknown.

Biology - The adults from Thailand and Sabah were extracted from forest litter.

Distribution - Indonesia (Sumatra); Thailand; Malaysia (Sabah); Philippines (Luzon, Mindanao); Solomon Islands (Gualcanal).

Species included - *O. distincta* Dajoz; *O. hirta* Dajoz; *O. luzonica* (Slipinski); *O. philippinensis* Dajoz; *O. punctata* Dajoz; *O. pubescens* Dajoz.

Discussion - The ventral processes of the head and acute temples, elongate, weakly sclerotized median lobe without the tegmen are unique (derived) for this genus. The systematic position of *Oroussetia* is unclear; the procoxal closure, stout antennae, obsolete tegmen and setose dorsum suggest an affinity with *Clavicerylon*.

Paracerylon gen. n.

Type species: *Cerylon biroi* Heinze, 1944d.

Gender: Masculine.

Etymology: The name constitutes a combination of a prefix Para with the classical name *Cerylon* referring to a close affinity between those genera.

— Slipinski 1981c (*yeti* and *humeridens* groups); 1988b (*curticollis*).

Diagnostic combination - Length 1.6-3.1 mm; body elongate to broadly-oval (fig. 48); moderately convex; often winged; usually with sparse but long setae on elytra, pronotal margins and disk,

rarely dorsum densely setose. HEAD: eyes large and prominent, sometimes reduced; antenna 10-segmented with 1-segmented club (fig. 96F); mouthparts of normal-type (fig. 96C, E), prementum bearing 3-4 setae on each side arranged as in fig. 96C. PROTHORAX usually weakly cordiform with margins not visible from above; disk of pronotum usually coarsely punctured; prosternum without antennal cavities; prosternal process wide, usually as wide or wider than coxa, expanded apically; coxal cavities widely closed externally (fig. 96G). Mesosternal process about as wide as coxa; metasternum and ventrite I without femoral lines. LEGS: protibia with distinct tooth at outer-apical angle (fig. 96B, D); tarsi 4-4-4; empodium always absent. ELYTRA with 8 rows of stria punctures; epipleura narrow, incomplete; scutellum large and pentagonal. AEDEAGUS without tegmen; median lobe (fig. 96A) with sclerotized internal ornamentation; spermatheca as in fig. 96H. Sexual differences: males can be recognized by having the clypeus more strongly and deeply emarginate than females.

Immature stages - Unknown.

Biology - Adults are commonly extracted from forest and leaf litter, or collected under bark.

Distribution - This large genus is widely distributed in the Indo-Australian region from Nepal and Japan to Fiji and New Hebrides.

Species included - *P. biroi* (Heinze); *P. braminus* (Motschulsky); *P. curticolis* (Sharp); *P. papuanus* (Heinze); *P. popei* (Slipinski); *P. yeti* (Slipinski).

Discussion - This genus is very similar to *Cerylon*; see that genus for differences.

Cerylon Latreille

Cerylon Latreille, 1802: 205. Type species, by designation of Latreille 1810: 431, *Lyctus histeroides* Fabricius, 1792.

Aphardion Gozis, 1886: 11.- Unjustified name change for *Cerylon* Latreille.

— Reitter 1876a; 1876c; Nakane 1967; Sen Gupta and Crowson 1973; Lawrence and Stephan 1975; Dajoz 1975a; 1976a; Slipinski 1988b.

Diagnostic combination - Length 1.2-3.2 mm; Body elongate-oval to parallel-sided (fig. 49); flattened; glabrous or rarely sparsely microsetose; usually winged. HEAD: eyes moderately large, rarely coarsely faceted; antenna 10-segmented with 1-segmented club (fig. 97C), antennomere III 1.0-1.2 × as long as IV; mouthparts of

normal type (fig. 97B), prementum with three setae on each side arranged as in fig. 97E. PROTHORAX trapezoidal; pronotal margins narrow, edges smooth; prosternum without antennal grooves or cavities; prosternal process expanded apically (fig. 97A), usually $1.3-2.0 \times$ as wide as coxa; procoxal cavities externally closed, internally open. Mesosternal process $1.0-1.2 \times$ as wide as coxa, flat; metasternum and ventrite I without femoral lines. LEGS: tarsi 4-4-4, tarsomeres simple; protibia slightly widened apically, always with tooth at outer-apical angle (fig. 97F); empodium present. ELYTRA with 8-9 rows of stria punctures; intervals flat; epipleura very narrow, incomplete apically; scutellum large, triangular. AEDEAGUS (fig. 97G) without tegmen, median lobe relatively simple, without complex ornamentation. Ovipositor as in fig. 10A. Sexual characters: males can usually be recognized by their clypeus being more strongly emarginate anteriorly and the pronotum more strongly narrowing toward the base.

Immature stages - SEN GUPTA and CROWSON (1973: 420-422) described and illustrated a supposed larva of the European species *C. histeroides* Fabricius; the larva, pupa and pupal cocoon (fig. 27, 28) of the same was illustrated by BURAKOWSKI and SLIPINSKI (1986: 73-74); see also p. 32-33.

Biology - The specimens are usually collected under bark of various tree, from log litter and rarely from forest and leaf litter. The larva of *C. histeroides* feeds in plasmodial Mycetozoa; before pupation it makes a loose pupal cocoon.

Distribution - Holarctic (including northern Japan). DAJOZ (1975b) recorded *Cerylon ferrugineus* Stephens from Bhutan, but the specimens belong to *Philothermopsis striativentris* (Champion) (S.A. SLIPINSKI, unpublished).

Species included - *C. californicus* Casey; *C. castaneus* Say; *C. conditus* Lawrence and Stephan; *C. deplanatus* Gyllenhal; *C. distans* Lawrence and Stephan; *C. fagi* Guérin; *C. ferrugineus* Stephens; *C. grandicollis* Reitter; *C. histeroides* (Fabricius); *C. impressus* Erichson; *C. sharpi* Nakane; *C. unicolor* (Ziegler);

Discussion - This genus is very similar to *Paracerylon* and to some species of *Philothermus*. It can be distinguished from all known species of *Philothermus* because of the protibia being dentate at its outer-apical angle, prosternal process wide and expanded apically, procoxal cavities externally widely closed, and the tegmen

obsolete. It shares with *Paracerylon* the dentate protibia, form of the prosternal process and closure of the procoxae, and obsolete tegmen; the characters listed include derived characters that seem to indicate their close relationship. So far the true *Cerylon* species are found only in the Holarctic while *Paracerylon* is widely distributed in the Indo-Australian region. All known species of *Paracerylon* have a moderately to strongly convex dorsum, vestiture of sparse but long hairs or bristles, empodium absent, and median lobe with complex internal ornamentation including spines, sclerites etc.

Pseudocerylon Grouvelle

Pseudocerylon Grouvelle, 1897: 389. Type species, by designation of Sen Gupta and Crowson 1973, *Pseudocerylon trimaculatum* Grouvelle, 1897.
— Sen Gupta and Crowson 1973: 418; Slipinski 1982b: 53.

Diagnostic combination - Length 1.9-3.1 mm; body broadly-oval (fig. 50); moderately to strongly convex; winged; dorsum usually galbrous. **HEAD**: eyes large; antenna 10-segmented with 1-segmented club (fig. 98E), antennomere III usually $1.5 \times$ as long as IV. Mouthparts normal type (fig. 98B), prementum multisetose (fig. 98E) and well sclerotized. **PROTHORAX** transverse, base usually pointed medially into a lobe and hind angles acute; prosternal process at least $2 \times$ as wide as coxa, widened apically, sometimes shallowly emarginate apically to receive weak mesosternal keel; cavities externally closed (fig. 98C), internally open. Mesosternal process at least $1.5 \times$ as wide as coxa, flat or weakly keeled. Metasternum and ventrite I without femoral lines but usually with two postcoxal pits. **LEGS**: tarsi 4-4-4, tarsomeres simple; protibia rounded apically; empodium present. **ELYTRA** with 8 rows of stria punctures; epipleura relatively wide, gradually narrowing apically, complete; scutellum triangular, very small but visible. **WING** without anal veins. **AEDEAGUS** with median lobe variable, usually simple; tegmen completely reduced (fig. 98D). Sexual characters: males usually with the anterior clypeal margin more widely and deeply emarginate than in females.

Immature stages - Unknown.

Biology - Specimens in India, Nepal and Thailand were extracted from forest litter.

Distribution - Nepal; India (Darjeeling); Indonesia (Java, Sumatra); Thailand; Malaysia (Sabah); Philippines (Luzon).

Species included - *P. bicolor* Grouvelle, *P. bouchardi* Grouvelle, *P. helleri* Heinze, *P. mika* Slipinski, *P. nigrum* Heinze, *P. resa* Hinton, *P. trimaculatum* Grouvelle.

Discussion - The phylogenetic relationships of this genus are uncertain. It shares with *Paracerylon* and *Cerylon* the obsolete tegmen, widely separated procoxae, prosternal process widened apically, and procoxal cavities closed externally. Unlike of both these genera, the scutellum is strongly reduced and the protibia obtusely rounded at the outer-apical angle in *Pseudocerylon*. The sclerotized and multisetose prementum is also distinctive for that genus. There are two distinct groups of species in that genus: one including smaller species with the pronotum being widest at base and arcuately narrowing anteriorly and the prosternal process more-or-less emarginate apically, and the second group with the pronotum being widest anteriorly and narrowing towards the base and the prosternal process apically almost straight. I was not able to dissect specimens from the first group (*helleri*, *bicolor*) therefore its status remains unclear.

Australiorylon Slipinski

Australiorylon Slipinski, 1988a: 15. Type species, by original designation, *Cerylon longipilis* Carter and Zeck, 1937.

Diagnostic combination - Length 1.5-2.8 mm; elongate; flat to moderately convex; winged; dorsum usually densely pubescent. HEAD: eyes usually large, rarely reduced to a few coarse facets; antenna 11-segmented with 2-segmented club (fig. 99B); mouthparts of normal type, prementum bearing four setae arranged as in fig. 99G. AEDEAGUS without antennal cavities; margins narrow, the lateral edges usually crenulate; prosternal process almost parallel-sided for basal 2/3 then abruptly widened apically (fig. 99E); coxal cavities broadly closed externally, partially closed internally. Mesosternal process about $0.5 \times$ as wide as coxa; metasternum and ventrite I without femoral lines. LEGS: protibia widened apically and dentate at outer-apical angle (fig. 99F); tarsi 4-4-4, empodium present. ELYTRA with 8-9 regular rows of punctures, striae never grooved; epipleura narrow, incomplete. AEDEAGUS with vestigial tegmen bearing reduced, multisetose parameres, ventral ring rarely absent (fig. 99H); median lobe (fig. 99A) usually with spiral, internal sclerotization. Sexual characters: males are distinguished by the anterior margin of the

clypeus being more deeply and widely emarginate (fig. 99I, J), last abdominal ventrite deeply emarginate apically (fig. 99C, D) and tergite VII with crenulate hind border fitting into this emargination, and sometimes with hind femur with a weak tooth on its inner margin.

Immature stages - Unknown.

Biology - Probably all the species are restricted to the rain-forest habitats in the Indo-Australian region. Adults have been collected under fungus-infested bark, in rotten logs and bark, from leaf litter and forest debris; one specimens was collected from unidentified fungi in Australia.

Distribution - Indo-Australian. Along the Pacific coast of Australia, Fiji, New Guinea, Philippine Islands, Indonesia, Thailand, Vietnam.

Species included - *A. longipilis* (Carter and Zeck); *A. luzonicus* (Dajoz); *A. nevoissi* Slipinski; *A. setosus* Slipinski.

Discussion - The deeply emarginate last abdominal ventrite in males and a modified 7th abdominal fitting into this emargination is unique for this genus. It is closely related to *Orientrylon* because of the protibia dentate at outer-apical angle, tegmen well-developed and prosternal process narrow and abruptly expanded apically. Unlike *Orientrylon* the tegmen is weakly asymmetrical and bears a ventral ring-like structure, the protibia is not widened apically and the last male abdominal ventrite is deeply emarginated in *Australiorylon*. The form of the prosternal process, procoxal closure, dentate protibia and densely setose body separates *Australiorylon* from similar *Philothermus* species.

Orientrylon gen. n.

Type species: *Cerylon baloghi* Slipinski, 1981a.

Gender: Masculine.

Etymology: the name is a combination of a prefix Orient- with the name *Cerylon* referring to the genus distribution.

Diagnostic combination - Length 2.1-3.2 mm; elongate to elongate-oval; moderately convex; winged; dorsum usually densely but shortly pubescent (fig. 51). HEAD: eyes large; antenna 11-segmented with 2-segmented club (fig. 100K); mouthparts normal or weakly elongate-type (fig. 100C, D, E, H, I), labium with prementum bearing four setae arranged as in fig. 100H. PROTHORAX

transverse, distinctly margined laterally, the edges usually crenulate (fig. 51); prosternal process narrow (fig. 100A), parallel-sided for basal 2/3 and abruptly expanded apically; coxal cavities narrowly closed externally. Mesosternum narrow (fig. 100B), about $0.5 \times$ as wide as coxa; metasternum and ventrite I without femoral lines. ELYTRA with 8 rows of stria punctures; epipleura narrow, incomplete apically. WING without anal veins. LEGS: tarsi 4-4-4, tarsomeres simple; empodium present; protibia widened apically and dentate at outer-apical angle (fig. 100G). AEDEAGUS with median lobe (fig. 100J) moderately sclerotized, with simple internal ornamentation; tegmen strongly asymmetrical without ventral ring (fig. 100F), parameres shortly setose. Sexual characters: males can usually be recognized by having the clypeus deeply emarginate anteriorly, sometimes with a median tooth, and the last abdominal ventrite with a shallow depression.

Immature stages - Unknown.

Biology - Adults have been collected by mass-sampling methods from forest litter.

Distribution - Nepal; India (Meghalaya, Madras, Madurai); Malaysia (Selangor); Singapore; Indonesia (Sumatra); Philippines (Mindoro); Vietnam; Papua New Guinea; Solomon Islands.

Species included - *O. baloghi* (Slipinski); *O. fallax* (Hinton).

Discussion - *Orientrylon* shares with *Australiorylon* the prosternal process parallel-sided for basal 2/3 and abruptly widened apically, protibia dentate at outer-apical angle, procoxal cavities externally closed, and dorsum setose. Unlike *Australiorylon* the last ventrite in males is not deeply emarginate apically at the tegmen is strongly asymmetrical in *Orientrylon*. In most species of *Orientrylon* examined, the pronotum is rounded laterally with margins distinctly crenulated, and the protibia widened apically in both sexes.

Afrorylon Slipinski, Stat. n.

Afrorylon Slipinski, 1980a:469. Type species, by original designation, *Cerylon substriatus* Grouvelle, 1919 (subgenus of *Philothermopsis* Heinze). — Dajoz 1979b: 444 (*torosum* group).

Diagnostic combination - Length 2.8-4.5 mm; body elongate to elongate-oval (fig. 52); moderately convex; winged; gla-

brous. HEAD: eyes large, often coarsely faceted; antenna 10-segmented with 1-segmented club (fig. 101C); mouthparts not elongate (fig. 101B) prementum well sclerotized bearing two long setae arranged as in fig. 101A. PROTHORAX subquadrate; margins very narrow, complete; prosternum without antennal cavities; prosternal process narrower than coxa, parallel-sided, rounded apically; procoxal cavities externally and internally open. Mesosternal process about $0.6 \times$ as wide as coxa, flat; metasternum and ventrite I with short femoral lines. LEGS: protibia dilated apically and with tooth at outer-apical angle (fig. 101D); tarsi 4-4-4; empodium present. ELYTRA with 7 rows of punctures, striae grooved, the 5th stria markedly deeper and wider near humeri (fig. 52); epipleura narrow, incomplete apically. AEDEAGUS with median lobe stout (fig. 101F) and with complex internal ornamentation; tegmen with ring-like basal piece and parameres partially fused (fig. 101E). Sexual characters: males can easily be recognized from females by the clypeus being deeply and widely emarginate anteriorly, the protibia more strongly dilated apically and often clavate, the antennae comparatively slender and longer, and the last ventrite with peculiar shallow, setose impression in males.

Immature stages - Unknown.

Biology - Most of the recent specimens have been extracted from forest and log litter.

Distribution - West-Central and eastern Africa; Madagascar; Thailand; Vietnam; Japan (Kyushu); Taiwan; Indonesia (Java, Sumatra, Bali); Philippines (Luzon); Malaysia (Penang, Sarawak, Sabah).

Species included - *A. amplicollis* (Fairmaire); *A. apicalis* (Grouvelle); *A. borneensis* (Hinton) stat. nov.; *A. camerunensis* (Sen Gupta and Crowson); *A. epistomalis* (Grouvelle); *A. minor* (Slipinski); *A. rubroniger* (Dajoz); *A. shibatai* (Sasaji); *A. substriatus* (Grouvelle); *A. takasago* (Sasaji); *A. testaceoruber* (Dajoz); *A. torosus* (Reitter);

Discussion - This genus constitutes a clear cut unit well separated from *Philothermopsis* by its large and convex body, the 5th elytral stria deeply grooved and widened near humeri, the male protibia usually expanded apically and often clavate, the metasternum often with vestigial femoral lines and the last ventrite of male with a peculiar setose depression.

Philothermopsis Heinze

- Philothermopsis* Heinze, 1944a: 30. Type species, here designated, *Cerylon alluaudi* Grouvelle, 1892a (subgenus of *Philothermus*).
Cerylonopsis Heinze, 1944a: 29. Type species, original designation, *Cerylon trifoveolatum* Heinze, 1944a (subgenus of *Cerylon*). **Syn. n.** - Heinze 1944d: 11 (full description of the genus and species).
Ebolowaia Dajoz, 1978: 185. Type species, by original designation, *Ebolowaia pubescens* Dajoz, 1978. **Syn. n.**
Manengouba Dajoz, 1978: 188. Types species, by original designation, *Manengouba elongata*, Dajoz, 1978. **Syn. n.**
 — Grouvelle 1902; Heinze 1944c; Slipinski 1981b: 708-711.

Diagnostic combination - Length 1.5-3.8 mm; elongate to elongate-oval; flat or rarely moderately convex; glabrous or microsetose; winged. **HEAD:** mouthparts of normal type, prementum with 3-4 setae on each side arranged as in fig. 102G; antenna 10-segmented with 1-segmented club (fig. 102I). **PROTHORAX** narrowly margined laterally; prosternum without antennal cavities; prosternal process parallel-sided or weakly expanded apically (fig. 102A); coxal cavities open or very narrowly closed externally by the notal projections. Mesosternal process narrow, about $0.5-0.7 \times$ as wide as coxa; metasternum and ventrite I usually with vestigial femoral lines. **LEGS:** protibia almost always with tooth at outer-apical angle (fig. 102B, H); tarsi 3-3-3 or 4-4-4; empodium present. **ELYTRA** with 8 rows of regular punctures; epipleura narrow and incomplete apically. **AEDEAGUS** with well-developed tegmen, parameres setose, ventral ring present (fig. 102C); median lobe variable, usually with internal ornamentation (fig. 102D). **Sexual characters:** males can usually be recognized by the anterior margin of the clypeus being more strongly and widely emarginate anteriorly, last abdominal ventrite with a shallow, often setose, impression, and in one African group the 4-4-4 segmented tarsi (females 3-3-3).

Immature stages - Unknown.

Biology - Adults have been collected from under bark or extracted from forest and leaf litter; *P. similis* was occasionally collected with unidentified ants.

Distribution - Old World (except Palaearctic but including Japan, Pakistan and South China).

Species included - *P. abnormis* (Slipinski); *P. alienigenus* (Blackburn); *P. alluaudi* (Grouvelle); *P. antennatus* Slipinski; *P. australis* (Slipinski); *P. crassipes* (Sharp); *P. elongatulus* (Slipinski); *P. elongatus* (Dajoz); *P. doyeri* (Slipinski); *P. hamatus* (Heinze); *P. hirtus*

(Grouvelle); *P. kolbei* (Grouvelle); *P. laevigatus* (Heinze); *P. liberiensis* Sen Gupta and Crowson; *P. loebli* Slipinski; *P. major* (Pope); *P. mazuri* Slipinski; *P. micans* Slipinski; *P. mirei* Dajoz; *P. muhavurens* (Pope); *P. niger* Dajoz; *P. nomia* (Hinton); *P. nova* Dajoz; *P. ovalis* Slipinski; *P. pygmaeus* (Gerstaecker); *P. pseudohamatus* Dajoz; *P. raffrayi* (Grouvelle); *P. quadricollis* (Sharp); *P. ruadensis* (Pope); *P. saigonensis* (Dajoz); *P. serum* (Hinton); *P. similis* (Pope); *P. striativentris* (Champion); *P. thoracicus* Dajoz; *P. trifoveolatus* (Heinze); *P. usambicus* (Kolbe); *P. weisei* (Grouvelle).

Discussion - Heinze (1944a: 30) included *Cerylon alluaudi* Grouvelle, *Cerylon kolbei* Grouvelle and two unnamed species from Cameroon as belonging to *Philothermopsis*. Neither *P. hamatus* nor *P. laevigatus* (Heinze 1944c) were included in the original diagnosis of the subgenus. Therefore, the designation of *P. hamatus* Heinze as the type of the subgenus by SEN GUPTA and CROWSON (1973: 429) is invalid, and *Cerylon alluaudi* Grouvelle, 1892 is here designated as the type species. *Cerylonopsis* was erected by HEINZE (1944a: 29) for the trimerous species *Cerylon trifoveolatus* Heinze from New Guinea. Although the complete description of *C. trifoveolatus* appeared in HEINZE 1944d (p. 11), the generic name and the species name published together with a diagnostic character (trimerous tarsi instead of 4-segmented) are valid generic and species descriptions. Because both these genera appeared in the same paper, and according to my opinion do not deserve separate generic status, I choose *Philothermopsis* to be applied to the taxon as the name is better known.

Philothermopsis is used here in a wider sense than in my previous papers and that of Sen Gupta and Crowson (1973), here, including the Indo-Australian *Cerylonopsis* Heinze as well. Both of these genera have been separated by the shape of the prosternal process and the closure of procoxal cavities. The Indo-Australian species have prosternal process weakly widened apically and the procoxal cavities narrowly closed by the notal projections, while in Africa most of the species have the cavities posteriorly open to some extent and the prosternal process more parallel-sided. All of the transitoria forms are found in Africa and the Indo-Australian region as well. This seems to be a strong correlation between the body convexity and the degree of closure of the procoxal cavities in this genus: usually the moderately convex or convex forms have their prosternal process parallel-sided while the flattened forms have the prosternal process

more-or-less expanded apically and the cavities tend to be closed by the notal projections. I have also included in this genus species with 4-segmented tarsi that have a dentate protibial apex, more-or-less developed femoral lines on at least ventrite I, well-developed aedeagal tegmen and no antennal grooves or cavities on the prothorax. This inclusion been made on two assumptions: (1) in one group of species from Africa (*similis*, *hirtus*, *ruandensis* etc.) the females have clearly 3-3-3 tarsi, while in males are clearly 4-4-4; (2) in many species with clearly 3-segmented tarsi the division between the two basal fused tarsomeres in males is clearly visible on a slide preparations. This genus can not be characterized by any synapomorphy, and its monophyly is questionable.

Belingaia Dajoz

Belingaia Dajoz, 1974b: 290. Type species, by monotypy, *Belingaia condei* Dajoz, 1974b.

Diagnostic combination - Length 1.5-2.1 mm; body narrowly-oval; weakly convex; winged; dorsum shortly and sparsely setose, sometimes almost glabrous. HEAD: eyes large and coarsely faceted; antenna 10-segmented with 1-segmented club (fig. 103F), antennomere III about $1.7 \times$ as long as IV; mouthparts of normal type, prementum with 6 setae arranged as in fig. 103D. PROTHORAX subquadrate, widest at base; pronotal disk coarsely punctured, margins barely visible from above, obscured by a weak paramarginal carinae; prosternum with natero-median part elevated; antennal cavities and grooves situated at lateral portions (fig. 14A, 103A) well limited; hypomera concave but without cavities; sternopleural sutures visible; prosternal process parallel-sided, almost as wide as coxa; coxal cavities externally and internally open. Mesosternal process as wide as coxa (fig. 103B), flat; metasternum with vestigial femoral lines; ventrite I with femoral lines bent inwardly and joined apically, with weak ridge medially (fig. 103C). LEGS: protibia with tooth at outer-apical angle (fig. 103E); tarsi 3-3-3, empodium absent. ELYTRA with 8 rows of punctures, striae grooved, at least intervals 5 and 7 convex or weakly carinate; epipleura very narrow, incomplete. AEDEAGUS with median lobe long, simple; tegmen with ventral ring and densely setose parameres. No external differences between sexes.

Immature stages - Unknown.

Biology - Unknown; two specimens from Ghana were collected in a light-trap.

Distribution - Ghana; Cameroon; Congo (Brazzaville).

Species included - *B. condei* Dajoz.

Discussion - The pronotal structure with weak para-marginal carinae and convex or carinate alternate intervals of the elytra are unique for this genus. It shares with *Nkolbissonia* the trimerous tarsi, antennal cavities well delimited and situated on prosternum, and the peculiar structure of the femoral lines on ventrite I. In addition, both of these genera have a well-developed tegmen, trimeours tarsi and dentate apex of the protibia. These characters are also found in most species of *Philothermopsis* and *Suakokoia*. All of these genera seem to form a distinct group united by their tarsal formula, dentate protibial apex, femoral lines developed at least on the ventrite I (that might be apomorphies) and very similar structure of the labium. The antennal cavities of *Nkolbissonia* and *Belingaia* are likely derived independently from similar structures found in *Pathelus* and certain *Philothermus*.

Nkolbissonia Dajoz

Nkolbissonia Dajoz, 1978: 190. Type species, by original designation, *Nkolbissonia mirei* Dajoz, 1978.

Diagnostic combination - Length 2 mm; This genus is very similar to *Belingaia* Dajoz and could be regarded as a junior synonym. The only differences are : in *Nkolbissonia* the elytral intervals are flat, not at all carinate; pronotum not clearly margined laterally and without raised carinae along sides, pronotal disk less coarsely and regularly punctured, while in *Belingaia* the elytral intervals are convex or almost carinate; pronotum with raised para-marginal carinae, pronotal disk densely and coarsely punctured, punctures in lateral concave areas much coarser than those in median convex part.

Immature stages - Unknown.

Biology - Unknown; one species collected at light.

Distribution - Nigeria; Cameroon.

Species included - *N. mirei* Dajoz.

Discussion . Very similar to *Belingaia*, see that genus for discussion.

Suakokoia Sen Gupta and Crowson

Suakokoia Sen Gupta and Crowson, 1973: 179. Type species, by original designation, *Suakokoia striata* Sen Gupta and Crowson, 1973.

Ahalaia Dajoz, 1978: 179. Type species, by original designation, *Ahalaia camerunensis* Dajoz, 1978. **Syn. n.**

Diagnostic combination - Length 2.3-3.8; body elongate (fig. 53); flattened or weakly convex; winged; glabrous. **HEAD**; eyes large, coarsely faceted: antenna 10-segmented with 1-segmented club (fig. 104D), antennomere III about $1.5 \times$ as long as IV, club weakly asymmetrical; mouthparts of normal type, prementum with 8 setae arranged as in fig. 104G. **PROTHORAX** transverse, always with raised paramarginal carinae; disk usually with deep cavities nate-ro-laterally (fig. 14E); hypomera concave, without well delimited antennal cavities (fig. 104A, B); prosternal process almost as wide as coxa, parallel-sided; coxal cavities externally and internally open; pleural sutures well visible marking an inner margin of antennal cavity on hypomera. Mesoternum as wide as coxa; metasternum and ventrite I with femoral lines (fig. 104C). **LEGS**: tarsi 3-3-3; protibia with tooth at outer-apical angle (fig. 104H); empodium absent. **ELYTRA** with 8 rows of punctures, striae always grooved; intervals convex or costate; epipleura narrow, incomplete; scutellum triangular, large. **AEDEAGUS** with complete tegmen; median lobe (fig. 104E) simple without internal ornamentation; tegmen with ventral ring and setose parameres (fig. 104F). No external differences between sexes.

Immature stages - Unknown.

Biology - Unknown.

Distribution - Sierra Leone; Liberia; Ghana; Gaboon; Nigeria; Cameroon; Angola; Zaire.

Species included - *S. gabonensis* (Dajoz); *S. grouvellei* Slipinski **nom. n.** (for *Cerylon aexcavatum* Grouvelle, 1896 nec *C. excavatum* Fowler, 1886); *S. camerunensis* (Dajoz); *S. nigeriana* Slipinski; *S. striata* Sen Gupta and Crowson; *S. szujeckii* Slipinski.

Discussion - This genus is characterized by the pronotum bearing raised paramarginal carinae and usually with deep pits (fig. 14E), elytra with convex or carinate intervals and grooved stria, trimerous tarsi, protibia dentate at outer-apical angle, and femoral lines present on the metasternum and ventrite I. I think the differences between Dajoz's genus *Ahalaia* and *Suakokoia* are insufficient to retain the former as an independent genus; the prothoracic

hypomera is concave in both forms and without clearly limited cavities, but there are two weak impressions in *camerunensis*, that are absent in *striata* (fig. 53). All species formerly placed in *Suakokoia*, except for the type species (*striata*), the prothorax bears specialized pits latero-laterally opening dorsally. There is no trace of these in *S. striata* nor in *S. camerunensis* (*gabonensis* is probably a synonym of the former). The relationship of this genus to the *Philothermopsis*-complex is discussed under *Belingaia* (p. 126).

Iviejus gen. n.

Type species: *Iviejus costatus* sp. n.

Gender: Masculine.

Etymology: This genus is dedicated to my friend Michael A. Ivie of Montana State University, USA, who has discovered in collections, and brought to my attention, this curious cerylonid.

Diagnostic combination - Length 3.1 mm; body elongate-oval; convex; winged?; dorsum almost dull and sparsely microsetose. HEAD with transverse occipital ridge; eyes large; antenna 10-segmented with 1-segmented club (fig. 103H), antennomere III 1.2 × as long as IV; mouthparts of piercing type, but not dissected; anterior clypeal margin rounded. PROTHORAX widest at posterior 1/3 more strongly narrowing anteriorly than posteriorly, with weak raised submarginal carina so sides appear to be double margined, the edges serrate; pronotal disk weakly convex medially, concave laterally along the margins, with serrate medial carina and two incomplete admedial ones. (fig. 54); prosternum prominent lateromedially into a plate covering gular part of head; hypomera with weak not clearly delimited antennal cavities, antennal grooves by anterior margin weak (fig. 103I); procoxal process slightly widened apically; coxal cavities externally open. Mesosternum trapezoidal, flat, about as wide as coxa; metasternum with short median impressed line at base; no femoral lines on metasternum and ventrite I. LEGS relatively long and slender; protibia rounded at outer-apical angle (fig. 103G); tarsi 4-4-4, empodium absent. ELYTRA with 8 rows of regular punctures; intervals 3, 5, 7 with irregular, serrate costae (fig. 54); epipleura narrowing at level of metacoxa but not dentate, complete. Wing and genitalia not examined.

Immature stages - Unknown.

Biology - Unknown.

Distribution - Ecuador: Napo-Pastaza.

Species included - *I. costatus* sp. n.

Discussion - The pronotal median carina, the costate and complex elytral intervals are unique for this genus. Because many characters (male genitalia, wing and mouparts) were not examined, it is difficult to place this genus in the subfamily, but the prosternal and antennal structures suggest an association with *Glyptolopus*.

***Ivievus costatus* sp. n.**

Length 3.1 mm. Dark brown; surface almost dull; vestiture of sparse, yellowish microsetae barely visible under $70\times$ magnification. HEAD: frons and vertex densely punctured, punctures slightly larger than eye facets, subcontiguous interspaces reticulate, mat. Pronotum transverse, $0.7\times$ as long as wide, widest at basal $1/3$, more strongly narrowing anteriorly than posteriorly; disk convex medially, punctures similar to those on head; lateral concave area with punctures larger and sparser than those in median part of pronotum. Scutellum $2\times$ as long as wide, narrow and triangular. Elytra $1.4\times$ as long as wide and $2.1\times$ as long as pronotum; intervals 3, 5 and 7 with serrate carinae, the 3rd interval apically divided and modified as in fig. 54; costae shortly microsetose; elytral punctures inconspicuous, round and 1.5 as large as those on median part of pronotum, and longitudinally separated by $0.3-0.5\times$ their diameter; even intervals about $0.5\times$ as wide as puncture diameter: Venter uniformly densely and coarsely punctured; prosternal plate rounded apically; antennal cavities on hypomera irregularly sculptured, mat; metasternum and ventrite regularly punctate; ventrite I transversely impressed at base between coxae.

HOLOTYPE (female): ECUADOR, 2.8 mi N. of Puyo, Napo-Pastaza, 953 n, 9.II.1955, E. I. Schilinger & E. S. Ross (CAS).

Cautomus Sharp

Cautomus Sharp, 1885a: 82. Type species, by monotypy, *Cautomus hystriculus* Sharp, 1885a.

Aculagnathus Oke, 1932: 22. Type species, by monotypy, *Aculagnathus mirabilis* Oke, 1932. - Synonymized by Besuchet 1972: 115.

Paracautomus Heinze, 1944a: 31. Type species, by monotypy, *Cautomus* (P.) *javanus* Heinze, 1944a (subgenus). **Syn. n.**

Leptoxycheilus Besuchet, 1972: 127. Type species, by original designation, *C. (L.) sugerens* Besuchet, 1972 (subgenus). **Syn. n.**

— Besuchet 1972 (genus revision).

Diagnostic combination - Length 1.1-4.5 mm; body elongate to broadly-oval; moderately convex; dorsum glabrous or sparsely and shortly setose; winged or wingless. **HEAD**: eyes variable, often reduced; antenna 9-11-segmented with 2-segmented club (fig. 55), the apical segment bearing 2-4 apical sensory appendages; mouthparts of piercing type (fig. 2-3), prementum with 4 strong setae in fig. 3A. **PROTHORAX** transverse, sides never clearly margined laterally, edges crenulate or denticulate and setose (fig. 55); prosternum raised antero-medially leaving antennal cavities not clearly limited externally; prosternal process almost parallel-sided, $0.5-0.8 \times$ as wide as coxa (fig. 14C); coxal cavities open externally and internally. Mesosternum $0.25 \times$ as wide as coxa, mesocoxae subcontiguous; Metasternum and ventrite I without femoral lines. **LEGS**: femora often swollen; tibiae irregular at outer margin, usually with sexual characters in males; tarsi 4-4-4 or rarely 3-3-3; empodium present. **ELYTRA** with 10-13 irregular rows of punctures; epipleura narrow, complete. Scutellum triangular, large. **AEDEAGUS** (sometimes not lying on one side) with median lobe well sclerotized often with complex internal structures; tegmen variable but well-developed, only in *mirabilis* tegmen reduced to a ring-like basal piece. Ovipositor as in fig. 8; spermatheca as in fig. 5C. Sexual characters: males almost always with hind tibiae curved inwardly and with all tibiae bearing spines at inner-apical angles (fig. 4E-G), rarely hind femora emarginate at posterior margin.

Immature stages - Unknown.

Biology - Collected in great numbers in various decaying vegetable debris, but mostly extracted from the forest floor and litter. The Australian *C. mirabilis* was associated with ants (*Amblyopone* sp.).

Distribution - Widely distributed in the Indo-Australian region from Nepal and Japan to Australia (Victoria).

Species included - *C. andrewesi* Grouvelle; *C. brevis* (Motschulsky); *C. convexus* Besuchet; *C. elongatus* Besuchet; *C. distinguendus* Besuchet; *C. hystriculus* Sharp; *C. javanus* Heinze; *C. latus* Besuchet; *C. longipillis* Besuchet; *C. macrops* Besuchet; *C. minutus* Slipinski; *C. mirabilis* (Oke); *C. myops* Besuchet; *C. nitidus* Besuchet; *C. philippinensis* Besuchet; *C. punctatus* Besuchet; *C. pusillus* Besuchet; *C. reticulatus* Besuchet; *C. singularis* Grouvelle; *C. striatus* Grouvelle; *C. sugerens* Besuchet; *C. venustus* Besuchet.

Discussion - This genus is separated from all other genera

by its uniquely derived sensory appendages on the antennal club and the confusedly punctate elytra. The procoxal structure, tegmen and obtusely rounded protibia suggest that this group could be derived from *Philothermus*-like ancestors. In most of the species examined the aedeagus, as in most Cerylonidae, is turned on its left side when retracted, and this may suggest end-to-end position during the copulation. Several undescribed forms, with extremely long hind legs bearing strongly curved, crenulate metatibiae have the aedeagus not lying on its side but bent towards dorsal side suggesting that the male, during copulation, is situated on the back of a female.

Glomerylon gen. n.

Type species: *Glomerylon gemma* sp. n.

Gender: Masculine.

Etymology: The name is a combination of a prefix Globo- and the name *Cerylon*, referring to a globose body form.

Diagnostic combination - Length 0.9-1.3 mm; body broadly-oval; convex; winged; dorsum smooth or sparsely microsetose. **HEAD** with occipital line; eyes prominent, large; antenna 9-segmented with 2-segmented club (fig. 105H), antennomere III 3-4 \times as long as IV; mouthparts of normal type (fig. 105C, D-F), prementum with four setae arranged as in fig. 105F. **PROTHORAX** widest at base, moderately strongly narrowing anteriorly; margins narrow; prosternum very similar to *Lapethinus* (fig. 13C, 15D, 105A) with antennal cavities on hypomera not clearly limited; prosternal process 1.2 \times as wide as coxa, parallel-sided; coxal cavities open externally, almost closed internally. Mesosternal process about twice as wide as coxa, convex, partially fitting into a weak emargination of the prosternal process when retracted. Metasternum with vestigial femoral lines close to anterior margin (fig. 105B). Ventrite with I vestigial to almost complete femoral lines. **LEGS**: tarsi 4-4-4, tarsomeres simple; protibia rounded apically (fig. 105E); empodium present. **ELYTRA** irregularly micropunctured to smooth; epipleura wide, incomplete apically; scutellum pentagonal. **WING** without anal veins. **AEDEAGUS**: median lobe short, with 2 internal sclerites; tegmen obsolete (fig. 105G). Ovipositor not examined. No external differences between sexes.

Immature stages - Unknown.

Biology - The specimens were extracted from logs and leaf litter.

Distribution - South India (Kerala); Sri Lanka; Indonesia (Java); Thailand (Doi Inthanon); Malaysia (Sabah).

Species included - *G. gemma* sp. n.

Discussion - This genus, because of its compact, broadly-oval body, head with a transverse occipital ridge and femoral lines on the metasternum and first ventrite, is very similar to *Mychocerus* and *Neolapethus*. It is distinguished from both these genera because of its antennal cavities on the hypomera not delimited and not covered from beneath by the prosternal plate, the femoral lines on metasternum vestigial and the tegmen obsolete.

Glomerylon gemma sp. n.

Length 0.9-1.1 mm. Dark-brown to almost black, legs and antennae yellow; surfaces feebly shiny; vestiture consists of long, erected and sparse yellowish setae (0.1 mm long), that are slightly longer than antennomere III and well visible under $30 \times$ magnification. HEAD: clypeus straight; frons and vertex convex, punctured, punctures about as large as eye facet 1.0-1.5 diameters apart; eyes large, prominent and moderately coarsely faceted; antenna as in fig. 105H. Pronotum transverse, about 0.5 times as long as wide, widest at base and arcuately narrowing anteriorly (fig. 56); margins wide and entirely visible from above: disk convex and regularly punctate except for limited areas near posterior angles that are impunctate, punctures $1.5-2.0 \times$ as large as eye facets, deep and coarse, 1.0-1.5 diameters apart; interspaces feebly reticulate. Scutellum triangular, slightly wider than long: ELYTRA rounded, $0.90-0.97 \times$ as long as wide and $2.1-2.3 \times$ as long as pronotum, widest at anterior fourth and arcuately narrowing apically; margins not visible from above; each elytron with 10 irregular rows of punctures, punctures as large as pronotal ones, usually not arranged in regular rows and variously spaced; intervals weakly reticulate; setae situated in more-or-less regular rows on intervals 2, 4, 6, 8, 10, 12. Prosternum as in fig. 105A; femoral lines on metasternum and ventrite I almost complete. Median lobe as in fig. 105G.

HOLOTYPE: Malaysia, Sabah: Crocker Ra., 1270 m, km 60 rte Kota Kinabalu-Tambunan, 17.V.1987, D. Burckhardt & I. Löbl (MHNG).

PARATYPES (29): same data as holotype (MHNG; IZPAN; MSNG).

Lapethinus Slipinski

Lapethinus Slipinski, 1984: 89. Type species, by original designation, *Lapethinus panamensis* Slipinski, 1984.

Diagnostic combination - Length 1.2-2.0 mm, body elongate-oval; moderately convex; winged; glabrous. HEAD with feeble transverse occipital line (fig. 106I); eyes large and prominent, often coarsely faceted; antenna 10-segmented with 1-segmented club, antennomere III at least twice as long as IV; mouthparts of moderately elongate type (fig. 106C, H), prementum bearing two long setae on each side (fig. 106C). PROTHORAX distinctly transverse; pronotal disk with transverse impression before base (fig. 59), margin smooth, entirely bordered; prosternum not prominent anteriorly into a plate, almost straight anteriorly, often with additional lines; antennal grooves at sides of prosternum deep (fig. 13F, 15E, 106A) and narrow, hypomera concave but without clearly limited cavities; prosternal process about $1.8 \times$ as wide as coxa, almost parallel-sided; cavities open externally and internally. Mesosternal process $1.2-1.4 \times$ as wide as coxa; metasternum and ventrite I without complete femoral lines (fig. 106B). WING without anal veins. LEGS: tarsi 4-4-4, tarsomeres simple; protibia weakly widened apically with weak tooth at outer-apical angle (fig. 106G); empodium present. ELYTRA with 8 rows of strial punctures; epipleura narrow, incomplete apically; scutellum large, pentagonal. AEDEAGUS (fig. 106E) with median lobe simple and curved; tegmen vestigial with unisetose parameres, without ventral ring (fig. 106F). Ovipositor not examined. No external differences between sexes.

Immature stages - Unknown.

Biology - Most of the specimens of this genus have been collected in simple of leaf litter under old trees or from log and leaf litter.

Distribution - Mexico (Veracruz); Panama; West Indies (Cuba, Hispaniola); Peru (Pasco).

Species included - *L. dominicanus* Slipinski; *L. mexicanus* Slipinski; *L. panamensis* Slipinski;

Discussion - Like *Pathelus*, *Belingaia*, *Nkolbissonia* and some *Philothermus*, the antennal cavities in *Lapethinus* are situated in sides of prosternum (not on the hypomera). *Lapethinus* can easily be distinguished from all the above mentioned genera in having well-

developed femoral lines on the metasternum and abdominal ventrite I. The prosternal lines and a weak transverse impression at the base of the pronotum in *Lapethinus* are also distinctive, and are uniquely derived for that genus. The antennal cavities in *Lapethinus* are probably not homologous with those of *Pathelus* etc., because of their different structure and function. The narrow and deep lateral cavities (or grooves) in *Lapethinus* receive only in the second and part of the third antennomere when retracted; the remaining part of antenna (including the club) is received by the concave hypomerone (fig. 13F, 15F). In *Belingia* (the antenna is relatively shorter and stouter) the anterior portion of the prosternum is elevated medially (fig. 14A) leaving a wide concave area laterally receiving the largest part of the antenna, including part of the club when retracted. A similar structure of antennal groove-cavity occurs in *Glomerylon* (fig. 13C), but in this genus the prosternum is also elevated antero-medially, the femoral lines are vestigial, the antennal club is 2-segmented and the tegmen is obsolete.

Rostrorylon gen. n.

Type species: *Rostrorylon vaucheri* sp. n.

Gender: Masculine.

Etymology: the name is a combination of a prefix Rostro- with the name *Cerylon*, referring to the rostrate mouthparts.

Diagnostic combination - Length 1.2-1.3 mm; broadly-oval; convex; winged; dorsum sparsely microsetose. HEAD with occipital ridge; eyes small, coarsely faceted; anterior clypeal margin rounded; antenna 9-segmented with 2-segmented club (fig. 107C); mouthparts extremely elongate (fig. 107E, F, H), prementum with two long setae as in fig. 107E. PROTHORAX transverse; base acute and prominent medially; disk with weak paramarginal carinae (fig. 58); prosternal plate elevated anteriorly and deeply notched medially to receive piercing beak when retracted (fig. 13D, 15C, 107A); antennal groove on sides weak but distinct, cavities on hypomeres distinct but not well delimited; prosternal process $1.3 \times$ as wide as coxa, parallel-sided; coxal cavities externally and internally open. Mesosternum $0.7 \times$ as wide as coxa, flat; metasternum without femoral lines; ventrite I with vestigial femoral lines (fig. 107D). LEGS: protibia rounded at outer-apical angle (fig. 107G); tarsi 4-4-4; empodium present. ELYTRA with 11 partially irregular rows of punctures; intervals, especially alternate ones, weakly convex and setose; epi-

pleura wide at base then abruptly narrowing at level of metacoxae (fig. 107B) but not dentate. AEDEAGUS without tegmen; median lobe longer than abdomen, not resting on its side, and with simple ornamentation.

Immature stages - Unknown.

Biology - Adults in Peru were collected from the leaf and log litter between wood and bark; the Colombian specimens was probably associated with fungi.

Distribution - Colombia; Peru.

Species included - *R. vaucheri* sp. n.

Discussion - The prosternal structure with deep notch anteriorly to receive the elongate mouthparts when retracted is a uniquely derived feature of this genus. The systematic position of *Rostrorylon* is unclear: the 9-segmented antenna with 2-segmented club, obtusely rounded protibia, lack of tegmen and a different prosternal structure preclude a close relationship to *Pseudolapethus* which it superficially resembles.

***Rostrorylon vaucheri* sp. n.**

Length 1.20-1.24 mm. Dark brown; surfaces densely reticulate and almost dull; vestiture of short and moderately dense whitish microsetose, barely visible under $50\times$ magnification. HEAD: frons and vertex densely punctate, punctures large, subequal in length to antennomere IV, almost contiguous. Antenna as in fig. 107C. Pronotum transverse, $0.5-0.6\times$ as long as wide, widest just before posterior angles (fig. 58), strongly narrowing anteriorly; lateral margins not visible from above, the edges weakly crenulate; disk convex medially, regularly sloping towards margins, with shallow concave area posteriorly on each side that is externally limited by weak carina starting from hind angle and obliquely continuing anteriorly up to $2/3$ of pronotum gradually becoming less distinct to obsolete; medial punctures on disk about $0.5-0.7\times$ as large as frontal ones, becoming larger and coarser laterally. ELYTRA as long as wide, $1.8-1.9\times$ as long as pronotum; humeri weakly tuberculate; elytral punctures slightly irregular in size and separation, usually subequal to these on vertex and longitudinally separated by $0.5\times$ their diameter; intervals 2, 4, 6, 8, 10, 12 carinate the carinae irregularly crenulate, alternate intervals distinctly convex and crenulate. Venter regularly and coarsely punctured. Median lobe $1.3\times$ as long as abdomen.

HOLOTYPE (male): PERU, Amazonie, Samiria près Zapote, 8.XI.1980, Claude Vaucher (extracted log and leaf litter between bark and wood of dead tree) (MHNG).

PARATYPES: same data as holotype, but 7.XI.1980 (1, MHNG; 1, IZPAN); COLUMBIA, Mitu, Vaupez, 27.VI.1972, Glasburg & Robbins col./ J.F. Lot No. 3382 (1, MCZ).

Neolapethus Sen Gupta and Pal

Neolapethus Sen Gupta and Pal, 1985: 27. Type species, by original designation, *Neolapethus orientalis* Sen Gupta and Pal, 1985.

Diagnostic combination - Length 2.1 mm; body broadly-oval; convex; winged; glabrous. HEAD with occipital ridge; eyes small, prominent; antenna 11-segmented with 2-segmented club (fig. 108B); mouthparts of elongate-type (fig. 108C, E, F), prementum with 4 setae arranged as in fig. 108C. PROTHORAX with deep antennal cavities situated on front angles of prosternum (fig. 108A); anterior part of prosternum forms a prominent plate covering head and antennal cavities from beneath, the plate weakly carinate medially; prosternal process as wide as coxa; cavities internally and externally open. Mesosternum $1.5 \times$ as wide as coxa, flat; metasternum and ventrite I with complete femoral lines as in *Mychocerus*. LEGS: protibia rounded at outer-apical angle; tarsi 4-4-4; empodium present. ELYTRA without regular rows of punctures, almost smooth; epipleura smooth, not dentate, incomplete; scutellum triangular. AEDEAGUS with reduced tegmen, median lobe simple (fig. 108D), moderately strongly sclerotized; tegmen with vestigial parameres, without ventral ring. No external differences between sexes.

Immature stages - Unknown.

Biology - Collected from leaf litter.

Distribution - Sri Lanka (Kandy Distr.).

Species included - *N. orientalis* Sen Gupta and Pal.

Discussion - The original diagnosis of this genus has to be altered after re-examination of the type series (MHNG). The type series includes part of the *Neolapethus orientalis* from Sri Lanka (holotype and 2 paratypes in MHNG), two species presently recognized as *Glomerylon*, and one species of *Eupsilobius* (Endomythidae). One *Glomerylon* is from southern India (Kerala) and the other from Sri Lanka. One of the *Neolapethus* paratypes has been examined on a slide;

the antenna is 11-segmented with 2-segmented club (not 10-segmented with 1-segmented club), and the aedeagus has a vestigial tegmen. The 11-segmented antenna with 2-segmented club and the prosternal plate almost covering the antennal cavities are unique for this genus. The structure of the antennal cavities, femoral lines and obtusely rounded elytral epipleuron suggest a close relationship with *Mychocerus*, and the only possible autapomorphy for *Neolapethus* is the form of the prosternal plate covering cavities from beneath.

Mychocerus Erichson

- Mychocerus* Erichson, 1845: 292. Type species, by monotypy, *Mychocerus ferrugineus* Erichson, 1845.
- Lapethus* Casey, 1890: 317. Type species, by monotypy, *Lapethus discretus* Casey, 1890. **Syn. n.**
- Lytopeplus* Sharp, 1895: 494. Type species, by monotypy, *Lytopeplus compactus* Sharp, 1895. - Synonymized with *Lapethus* by Hinton 1936: 185.
- Brachylon* Gorham, 1898: 256. Type species, by monotypy, *Brachylon breve* Gorham, 1898. - Synonymized with *Lapethus* by Champion 1913: 79.
- Lapecautomus* Sen Gupta and Crowson, 1973: 409. Type species, by original designation, *Lapecautomus dybasi* Sen Gupta and Crowson, 1973. - Synonymized with *Lapethus* by Lawrence and Stephan 1975: 154.
- Decalopethus* Dajoz, 1978: 207. Type species, by original designation, *Lapethus antennatus* Dajoz, 1978 (subgenus of *Lapethus*). **Syn. n.**
- Grouvelle 1892b; 1898a; 1903; Heinze 1944b; Hinton and Ancona 1934; Sasaji 1983; Slipinski 1984: 20-89 (genus revision).

Diagnostic combination - Length 1.1-3.2 mm; elongate-oval to broadly-oval; moderately to strongly convex, rarely almost globose; usually winged; glabrous or sparsely microsetose. HEAD with occipital ridge (Fig. 109A); eyes variable, sometimes reduced to a few coarse facets; antenna 8 or 10-segmented (fig. 109B) with 1-segmented club; mouthparts normal to elongate (fig. 109D, I, K), prementum with 4 setae arranged as in fig. 109K. PROTHORAX margined laterally, edges smooth; pronotal disk rarely with submarginal grooves; prosternum elevated anteriorly into a plate covering head from beneath when retracted; antennal cavities situated in anterior angles of prothoracic hypomera (fig. 109C); prosternal process variable, usually weakly expanded apically, 1.0-1.5 × as wide as coxa; cavities externally open or very narrowly closed by the expanded prosternal process. Mesosternum usually wider than coxa; metasternum and ventrite I with complete femoral lines (fig. 109E, F). LEGS: protibia rounded at outer-apical angle (fig. 109G); tarsi 4-4-4; tarsomeres simple; empodium present. ELYTRA with 8-10 rows of punctures, sometimes smooth; intervals flat or weakly convex; epipleura never

dentate at level of metacoxae, narrow, incomplete. AEDEAGUS with rudimentary tegmen: median lobe simple with 1-3 apical sclerites (fig. 109H); tegmen without ventral ring and distinct parameres, sometimes reduced to a ring-like basal piece or absent (fig. 109J). No external differences between sexes.

Immature stages - SLIPINSKI (1984) described a presumed larva of *M. ferrugineus* (1984: 22-23); see also p. 35-36.

Biology - Adults are recorded from litter under various trees, leaf litter, hollow logs, fungi, under bark, and a refuse deposit of the leaf-cutting ant *Atta mexicana*.

Distribution - Central and eastern Africa; Seychelles Islands; Japan; Papua New Guinea, Australia (including Lord Howe Island and Norfolk Island), New Caledonia and Fiji. One species (*M. astrolabei*) is widely distributed in the Indo-Australian region from India (West Bengal) to the Philippines (Mindanao) and to Australia (Queensland); USA (Tennessee, North Carolina, Washington to California), and then widely distributed through Central America (including West Indies) to South America.

Species included - *M. alicjae* (Slipinski); *M. alluaudi* Grouvelle; *M. angolanus* (Slipinski); *M. antennatus* (Dajoz); *M. astrolabei* (Heinze); *M. australis* (Slipinski); *M. brevis* (Gorham); *M. caledonicus* (Slipinski); *M. catena* (Grouvelle); *M. compactus* (Sharp); *M. convexus* (Slipinski); *M. crassus* (Reitter); *M. crowsoni* (Slipinski); *M. curtulus* (Champion); *M. discretus* (Casey); *M. dybasi* (Sen Gupta and Crowson); *M. ferrugineus* Erichson; *M. gularis* (Slipinski); *M. hintoni* nom. n. (for *M. ferrugineus* Hinton and Ancona, 1934 nec *M. ferrugineus* Erichson, 1845); *M. insularis* (Grouvelle); *M. johni* (Heinze); *M. kivuensis* (Slipinski); *M. laevipennis* (Champion); *M. laevis* (Grouvelle); *M. lawrencei* (Slipinski); *M. newtoni* (Slipinski); *M. nova* (Slipinski); *M. oaxacanus* (Slipinski); *M. ocelleatus* (Slipinski); *M. orientalis* (Sasaji); *M. parallelus* (Slipinski); *M. peckorum* (Slipinski); *M. prosternalis* (Slipinski); *M. pseudostriatus* (Slipinski); *M. punctulatus* (Slipinski); *M. queenslandicus* (Slipinski); *M. reducens* (Slipinski); *M. santacatarinae* (Slipinski); *M. similis* (Slipinski); *M. simoni* Grouvelle; *M. striatus* (Sen Gupta and Crowson); *M. sulcatus* (Slipinski); *M. sulcimargo* (Champion); *M. tibialis* (Champion).

Discussion - This is the second largest genus within the family including 45 described and at least 20 unnamed species. The

African species are characterized by the plesiomorphic number of antennomeres (10 instead of 8) and usually more flattened form suggesting a subcortical habitat. This genus is closely related to *Neolapethus* and *Pseudolapethus* as indicated by the position of the antennal cavities situated anteriorly on the prothoracic hypomera. *Neolapethus* is separated by its 11-segmented antennae with 2-segmented club and the prosternal plate covering the cavities from beneath. *Pseudolapethus* seems to be derived from the *Mychocerus* line and bears the dentate epipleuron, reduced scutellum and prosternal plate not covering the antennal cavities. *Mychocerus* includes forms with elongate mouthparts previously placed in *Lapecautomus* and those with the prosternal process weakly expanded apically recognized as *Lytopeplus*. The characters listed by SEN GUPTA and PAL (1985) to resurrect *Lapecautomus* and *Lytopeplus*, (which were synonymized by LAWRENCE and STEPHAN (1975) are homoplasies and of no particular value for determining the status of genera. So far, no synapomorphy has been discovered to unite all *Mychocerus* species.

***Pseudolapethus* Slipinski**

Pseudolapethus Slipinski, 1984: 98. Type species, by original designation *Pseudolapethus serricollis* Slipinski, 1984.

Diagnostic combination - Length 1.1-1.6 mm; elongate-oval; convex; winged; dorsum with vestiture of short and sparse setae. HEAD with occipital ridge (fig. 110A); anterior clypeal margin acutely prominent medially; eyes small, often reduced; antenna 8-segmented with 1-segmented club (fig. 110F); mouthparts of elongate, piercing-type (fig. 110B, E, J), mandible blade-like, prementum bearing 4 setae arranged as in fig. 110E. PROTHORAX transverse; dorsum convex medially with shallow paramarginal depressions (fig. 57), lateral edges crenulate; prosternal plate prominent and acuminate medially to receive clypeus when retracted; antennal cavities situated on hypomera and well delimited (fig. 13B, 15B, 110C); prosternal process about as wide as coxa, parallel-sided; coxal cavities externally and internally open. Mesosternum as wide as coxa, flat; metasternum and ventrite I with femoral lines (fig. 110D). LEGS: protibia rounded at outer-apical angle; tarsi 4-4-4; tarsomeres simple; empodium present. ELUTRA with 9 rows of punctures; intervals weakly carinate; epipleura dentate at level of metacoxa, incomplete; scutellum very small, triangular and almost invisible from above. AEDEAGUS with

reduced tegmen: median lobe (fig. 110G) slender, without internal ornamentation; tegmen without parameres (fig. 110H). Ovipositor not examined. Sexual characters: a male of an undescribed species from Peru has hind tibiae with spines on inner-apical angles and transverse (stridulatory?) file on ventrite I (fig. 110D).

Immature stages - Unknown.

Biology - Adults have been collected in forest litter, under rotting logs.

Distribution - Panama; Peru (Amazonas).

Species included - *P. serricollis* Slipinski.

Discussion - As indicated by the position of the antennal grooves and the aedeagal structure, *Pseudolapethus* is closely related to *Myhocerus* but differs by having the elytral hypomeron toothed at the level of the metacoxae, scutellum reduced, protibia with a weak apical tooth, and elytral intervals weakly carinate.

Lawrenciella Nom. n.

Lawrenciella Slipinski, 1988a: 44 nec *Lawrenciella* Strand, 1932: 142 [Arachnida].

Type species, by original designation, *Lawrenciella costata* Slipinski, 1988a.

Diagnostic combination - Length 3.1mm; broadly-oval; convex; winged; dorsum dull with sparse microsetae. HEAD and mouthparts similar to *Axiocerylon* but apparently shorter (not dissected); eyes large and coarsely faceted; antenna 11-segmented with 2-segmented, well divided, club (fig. 102E). PROTHORAX with antennal grooves and cavities situated on hypomera and not clearly limited posteriorly; pronotum with sides explanate, margins upturned and widely bordered; disk convex medially and weakly concave laterally, bearing 8 small tubercles in two rows (fig. 60); prosternal process narrow, parallel-sided, rounded apically. Mesosternal process about $0.7 \times$ as wide as coxa; metasternum and ventrite I without femoral lines. LEGS: femora weakly widened apically; protibia rounded at outer-apical angle (fig. 102F); tarsi 4-4-4; empodium present. ELYTRA with four raised costae (fig. 60), striae-punctate; epipleura wide, weakly toothed at level of metacoxae, complete; scutellum narrow, triangular. Wings and aedeagus not studied.

Immature stages - Unknown.

Biology - The only known specimen of the genus was collected under bark of dead «oak».

Distribution - Known only from Australia: Queensland (Lamington National Park).

Species included - *L. costata*, (Slipinski).

Discussion - This genus shares with *Axiocerylon* Grouvelle coarsely sculptured body surfaces, costate elytra, and deep and long antennal cavities on the prothoracic hypomera. It can be distinguished from *Axiocerylon* by its 11-segmented antenna with well divided 2-segmented club, pronotal ornamentation simple, which lacks the transverse tubercles and grooves characteristic of *Axiocerylon*, femoral lines absent, and elytral punctures inconspicuous. In relation to *Axiocerylon* it possesses many plesiomorphic characters, the pronotal tubercles and grooved (not punctate) elytral striae might constitute autapomorphies for this genus. *Lawrenciella* is similar to the South American genus *Glyptolopus* Erichson, but the latter does not have antennal grooves on the prothoracic hypomera, the antennal club is 3-segmented and the elytral punctures are large and well separated.

Axiocerylon Grouvelle

Axiocerylon Grouvelle, 1918: 41. Type species, by designation of Sen Gupta and Crowson 1973: 435, *Axiocerylon cavicolle* Grouvelle, 1918.

Paraxiocerylon Heinze, 1944d: 21. Type species, by original designation, *Axiocerylon* (*P.*) *degeneratum* Heinze, 1944d (subgenus). - Synonymized by Besuchet and Slipinski 1988: 901.

Decaxiocerylon Dajoz, 1984: 24. Type species, by original designation, *Axiocerylon* (*Decaxiocerylon*) *nigeriense* Dajoz, 1984 (subgenus). - Synonymized by Besuchet and Slipinski 1988: 901.

— Slipinski 1985b: 7; Besuchet and Slipinski 1988 (review of the genus).

Diagnostic combination - Length 1.05-3.60 mm; body broadly-oval; convex; usually winged; dorsal vestiture consists of very short and sparse, somewhat scale-like setae. HEAD with transverse occipital ridge; eyes variable, often reduced to a few coarse, unpigmented facets; antenna 6-10-segmented with 1-segmented club (fig. 111F, G) (in *A. cavicolle* club 2-segmented); mouthparts variable, often elongate, prementum with two long setae at base (fig. 111D, E, H). PROTHORAX with characteristic pattern of transverse raised portions and grooves (fig. 1, 111A); prosternum with antennal grooves and cavities situated on hypomera and reaching far behind middle of prosternum (fig. 111B); prosternal process parallel-sided; coxal cavities externally and internally open. Mesosternum 0.9-1.2 × as wide as coxa; metasternum and ventrite I with vestigial femoral lines (fig.

111C). LEGS: tibiae often crenulate and always rounded at outer-apical angle (fig. 111J); tarsi 4-4-4, rarely tarsomeres III and IV almost fused, and I weakly lobed below; empodium absent. ELYTRA with 9 rows of punctures and 3 strong carinae on each elytron (fig. 1); epipleura dentate at level of metacoxa, incomplete (fig. 111I). Scutellum very small but visible from above. AEDEAGUS with median lobe simple and elongate; tegmen absent. No external differences between sexes.

Immature stages - Unknown.

Biology - Adults have mostly been collected by sifting dead leaves, forest litter, rotten wood and bark.

Distribution - Tropical Africa; Mascarene and Seychelles Islands; Sri Lanka; Indonesia (Sumatra, Bali); Malaysia (Sarawak, Sabah); Philippines (Luzon, Mindoro); Papua New Guinea; Solomon Islands; Fiji.

Species included - *A. baloghi* Besuchet and Slipinski; *A. beta* Dajoz; *A. bournei* Besuchet and Slipinski; *A. brincki* Slipinski; *A. burckhardti* Besuchet and Slipinski; *A. cambeforti* Dajoz; *A. cavicolle* Grouvelle; *A. decemcostatum* Besuchet and Slipinski; *A. degeneratum* Heinze; *A. ghanense* Besuchet and Slipinski; *A. gomyi* Besuchet and Slipinski; *A. grouvellei* Dajoz; *A. hammondi* Besuchet and Slipinski; *A. humerale* Besuchet and Slipinski; *A. kaszabi* Heinze; *A. loebli* Besuchet and Slipinski; *A. luzonicum* Besuchet and Slipinski; *A. minimum* Besuchet and Slipinski; *A. monstrosus* (Grouvelle); *A. myops* Besuchet and Slipinski; *A. nigeriense* Dajoz; *A. brousseti* Besuchet and Slipinski; *A. peckorum* Besuchet and Slipinski; *A. roberti* Besuchet and Slipinski; *A. sculpticolle* (Grouvelle); *A. setulosum* Heinze; *A. solomonense* Besuchet and Slipinski; *A. triste* Besuchet and Slipinski; *A. variabilis* Besuchet and Slipinski; *A. venustum* Besuchet and Slipinski; *A. vinsoni* Dajoz.

Discussion - This genus is a distinctive group with the following uniquely derived features: pronotal ornamentation (the complex system of a transverse raised area and grooves connected with deep sublateral pits), sharply costate elytra, and a compact, 1-segmented club (except for *cavicolle*). The elongate, not posteriorly delimited antennal cavities on the hypomera and 4-segmented tarsi are shared with the Australian genus *Lawrenciella*. *Lawrenciella* has the antennal club clearly 2-segmented, pronotum without pits and transverse raised areas, and no femoral lines.

Thyroderus Sharp

Thyroderus Sharp, 1885a: 82. Type species, by monotypy, *Thyroderus porcatus* Sharp, 1885a.

Dolosus Dajoz, 1963: 91. Type species, by original designation, *Dolosus leleupi* Dajoz, 1963. - Synonymized by Slipinski 1982b: 56.

Diagnostic combination - Length 1.3-2.5 mm; body elongate-oval (fig. 61); usually convex; sparsely setose; winged or wingless. HEAD with distinct occipital ridge; eyes variable, often reduced; antenna 8-10 segmented with 1-2-segmented club (fig. 112D, F); mouthparts weakly elongate but not of piercing-type (fig. 112C, E, I), prementum bearing two setae as in fig. 112I. PROTHORAX variable, always with lateral translucent areas (fig. 61) and deep, posteriorly limited antennal cavities on hypomera (fig. 13E, 15F, 112A); prosternal plate elevated anteriorly; prosternal process narrow, about as wide as coxa, parallel-sided; coxal cavities externally open. Mesosternum as wide as coxa; metasternum and ventrite I with vestigial femoral lines (fig. 112B). LEGS flattened; protibia with weak tooth at outer-apical angle (fig. 112H); tarsi 4-4-4; empodium reduced or absent. ELYTRA with 9 rows of regular punctures; intervals often weakly convex; epipleura toothed at level of metacoxae, complete. Wing without anal vein. AEDEAGUS without tegmen; median lobe slender, without complex ornamentation (fig. 112G). Sexual characters: in two African species the last abdominal ventrite in male bears an impressed, densely setose area.

Immature stages - Unknown.

Biology - Most adults were extracted from forest and leaf litter.

Distribution - Sierra Leone; Liberia; Ivory Coast; Togo; Cameroon; Angola; Zaire; Ruanda, Uganda; Kenya; Nepal; northern India (West Bengal; Assam); northern Thailand; Singapore; Taiwan; Japan.

Species included - *T. basilewskyi* (Dajoz); *T. elgonicus* Dajoz; *T. grouvellei* Dajoz; *T. kittenbergeri* Heinze; *T. leleupi* (Dajoz); *T. microphthalmus* (Dajoz); *T. mirei* Dajoz; *T. ruwenzoricus* Dajoz; *T. porcatus* Sharp.

Discussion - The translucent lateral areas on the prothorax and deep, posteriorly limited antennal cavities on the hypomera are unique for this genus. The systematic position of this genus is problematic; the antennal cavities on the hypomera, the dentate

epipleuron and the body sculpture suggest relationship with *Axiocerylon* and *Angolon*. The mouthparts, simple and elongate median lobe, and absence of a tegmen support this placement as well. *Angolon*, having trimerous tarsi and the unique structure of the femoral and tarsal grooves on the ventral side, and the *Axiocerylon-Lawrenciella* complex with 4-segmented tarsi but not posteriorly delimited antennal cavities could have been derived from *Thyroderus*-like ancestors (*Lawrenciella* is here postulated to have the tegmen absent).

Angolon Dajoz

Angolon Dajoz, 1977a: 92. Type species, by original designation, *Angolon machadoi* Dajoz, 1977a.

Diagnostic combination - Length 1.5-2.8 mm; elongate-oval to broadly-oval; convex; usually winged; dorsum sparsely microsetose. HEAD with occipital ridge (fig. 113D); eyes variable, often reduced; antenna 6-9-segmented with 2-segmented club (fig. 113E); mouthparts elongate-type, almost piercing (fig. 113F, H, I), prementum with 2 setae (fig. 113F). PROTHORAX widest near base and narrowing anteriorly; pronotal base acutely prominent medially; sides weakly explanate with shallow depression posteriorly (fig. 62). Prosternum elevated anteriorly; hypomera with distinct antennal cavities and tarsal grooves; prosternal process parallel-sided; coxal cavities externally open. Mesosternum 1.0-1.2 × as wide as coxa, weakly elevated; metasternum and ventrite I with distinct tarsal and femoral grooves (fig. 113A, B) to receive legs when retracted. LEGS: protibia rounded at outer-apical angle; tarsi 3-3-3, tarsomere I weakly lobed below (fig. 113G); empodium absent. ELYTRA with 9 rows of punctures, at least some intervals weakly convex or carinate; epipleura dentate at level of metacoxae, incomplete; scutellum very small, triangular. AEDEAGUS without tegmen; median lobe long and slender with 2 apical sclerites (fig. 113C). No external differences between sexes.

Immature stages - Unknown.

Biology - Adults have been extracted from forest and leaf litter.

Distribution - Widely distributed in Tropical Africa; there is one undescribed species from South Africa (Transvaal), but its generic status is problematic because of its 4-segmented tarsi.

Species included - *A. africanum* Dajoz; *A. machadoi* Dajoz.

Discussion - The unique femoral and tarsal grooves on the venter is a synapomorphy for this genus (including about 6 undescribed species). The relationships with *Thyroderus* and *Axiocerylon* seems to be indisputable because of the antennal cavities on the prothoracic hypomera well-developed and reaching behind the middle, elytral intervals weakly costate, tegmen obsolete, elytral epipleuron dentate, and anterior part of prosternum produced anteriorly covering the head from beneath.

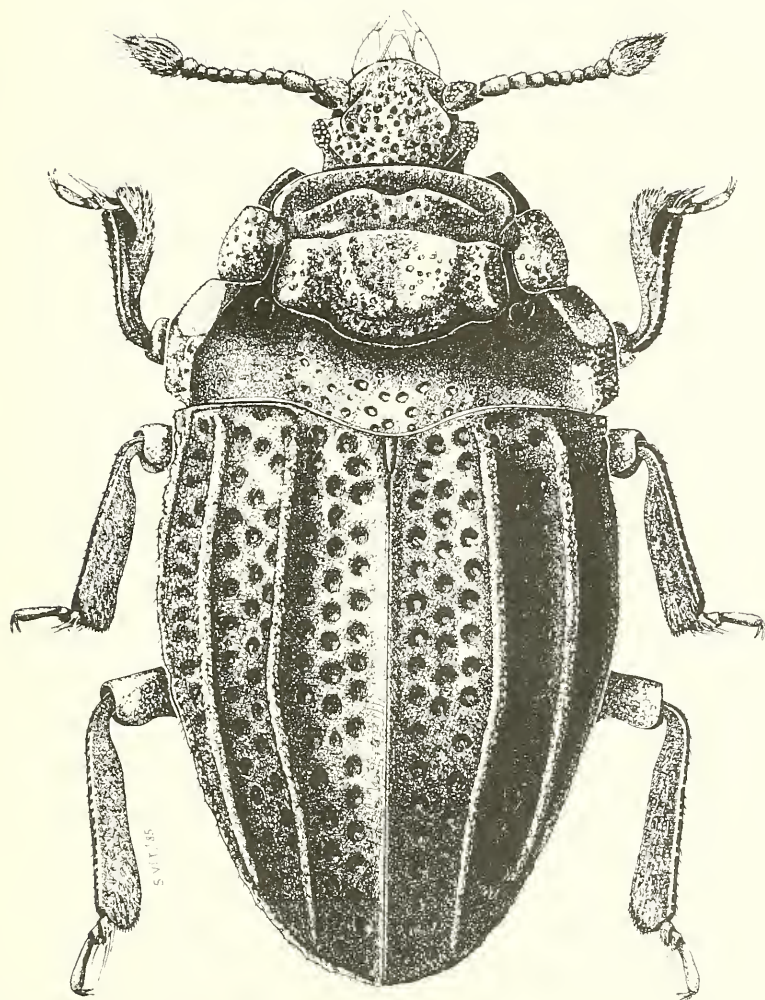


Fig. 1. *Axiocerylon monstruosum* (Grouvelle), by S. Vit

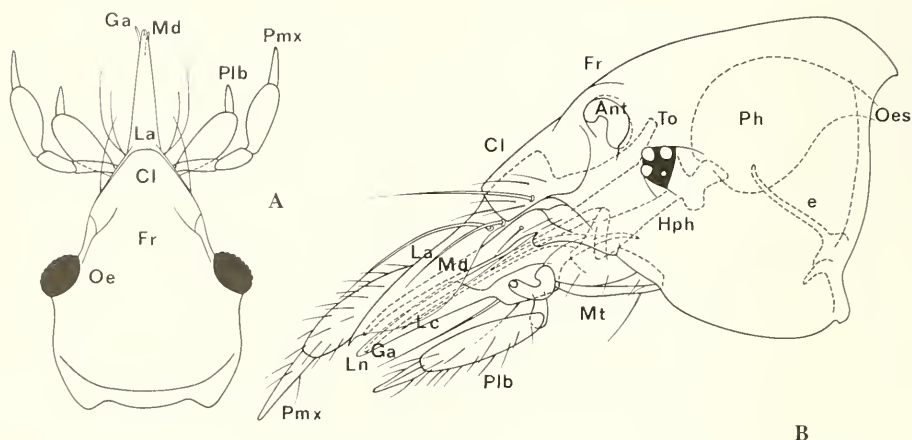
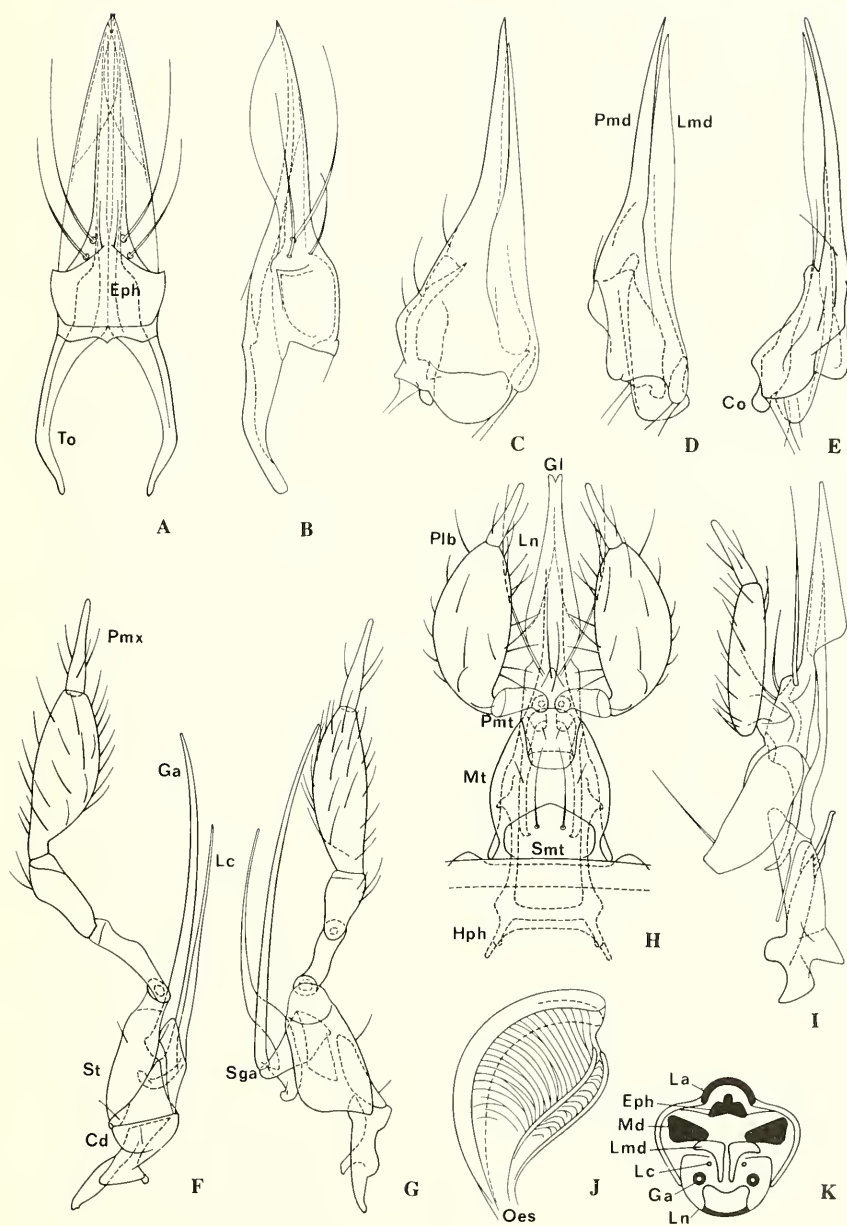
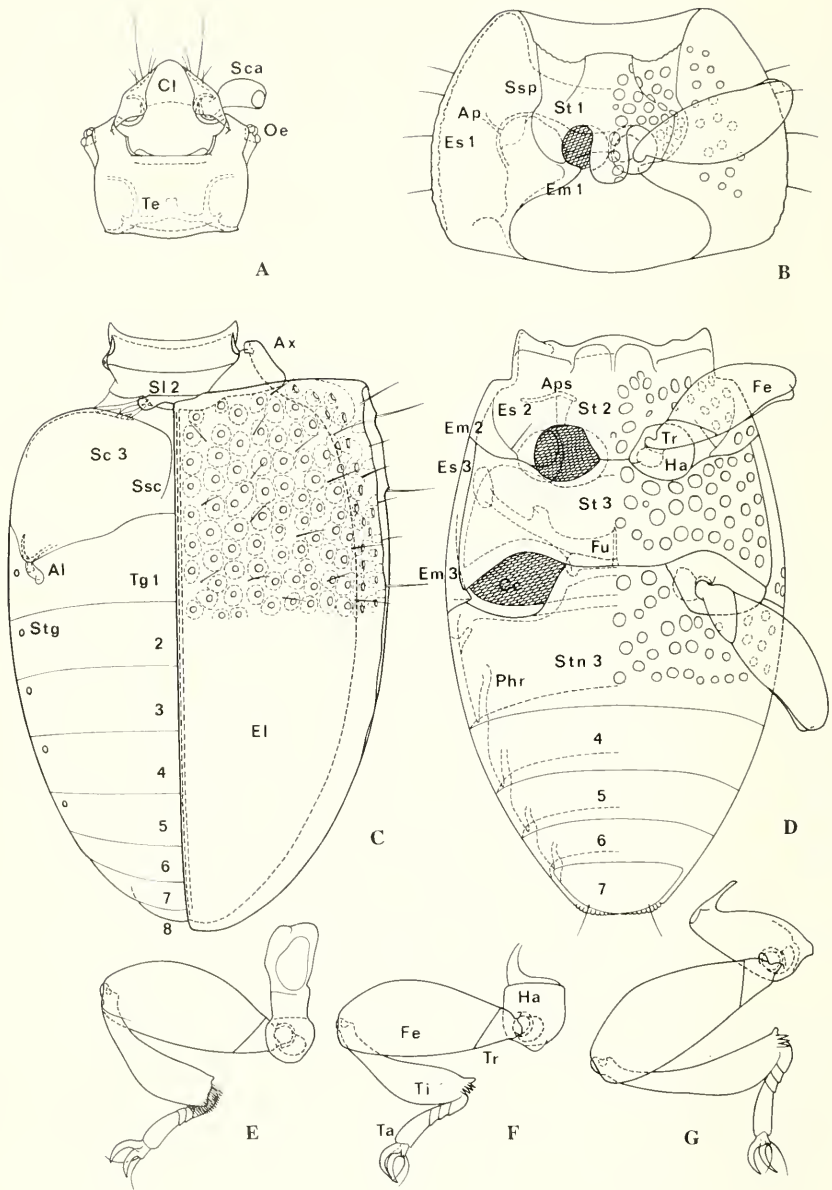


Fig. 2. a - *Cautomus elongatus*, head, dorsal view; b - *Cautomus sugerens*, head, lateral: Ant - antennifer; cl - clypeus; fr - frons; ga - galea; hph - hypopharynx; la - labrum; lc - lacinia; ln - ligula; md - mandible; mt - mentum; oe - eye; oes - oesophagus; ph - pharynx; plb - labial palps; pmx - maxillary palps; te - tentorium; to - torma.

Fig. 3. *Cautomus sugerens*, mouthparts: a - labrum-epipharynx, dorsal; b - same, lateral; c - right mandible, dorsal; d - same, inner view; e - same, external view; f - left maxilla, ventral; g - same, dorsal; h - labium-hypopharynx, ventral; i - same, lateral; j - oesophagus; k - cross-section through piercing beak near middle, heavily sclerotized parts black. cd - cardo; co - condyle; eph - epipharynx; ga - galea; gl - glossa; hph - hypopharynx; la - labrum; lc - lacinia; lmd - prosthema; ln - ligula; md - mandible; mt - mentum; oes - oesophagus; plb - labial palps; pmd - mandibular blade; pmt - prementum; pmx - maxillary palps; sga - subgalea; smt - submentum; st - stipes; to - torma.





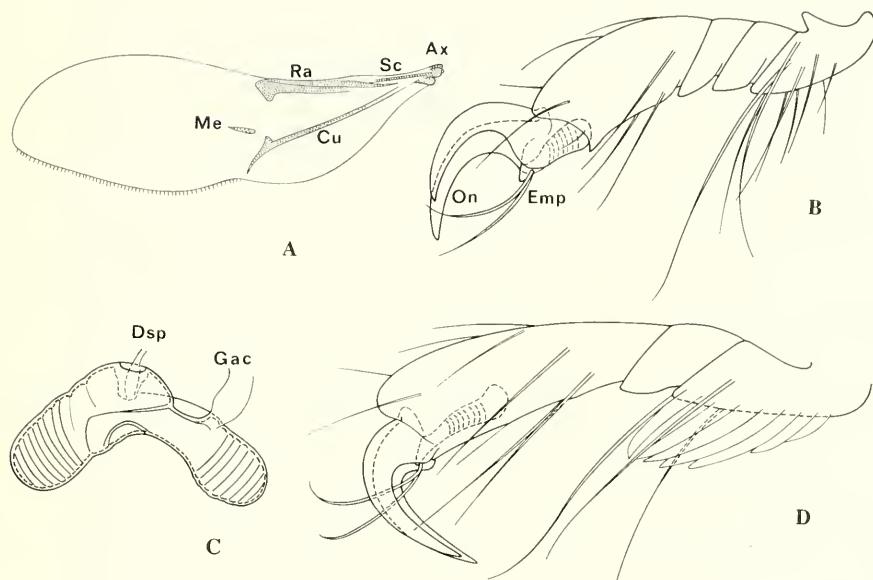


Fig. 5. *Cautomus* spp. a - wing; b, d - protarsus; c - spermatheca; ax - axillary sclerites; cu - cubital vein; dsp - spermathecal duct; emp - empodium; gac - spermathecal gland; me - median vein; on - claw; ra - radial vein; sc - subcostal vein.

Fig. 4. *Cautomus sugerens*: a - head, ventral; b - prothorax, ventral; c - pterothorax and abdomen, dorsal, one elytraon removed; d - same, ventral; e - prothoracic leg; f - mesothoracic leg; g - metathoracic leg. al - wing (reduced); ap - apodeme; aps - mesendosternite; ax - axillary sclerite of elytron; cc - coxal cavities; cl - clypeus; el - elytron; em1, em2, em3 - pro-meso- and metathoracic epimeres; es1, es2, es3 - same episterna; fe - femur; fu - metendosternite; ha - coxa; oe - eye; phr - internal apodemes; sca - scape; sc3 - metascutum; sl2 - mesoscutellum; ssc - scutal suture; ssp - sternopleural suture; st1, st2, st3 - pro-, meso-, metasternum; stg - spiracle; stn3 ... 7 - abdominal sterna; ta - tarsus; te - tentorium; tgl ... 8 - abdominal terga; ti - tibia; tr - trochanter.

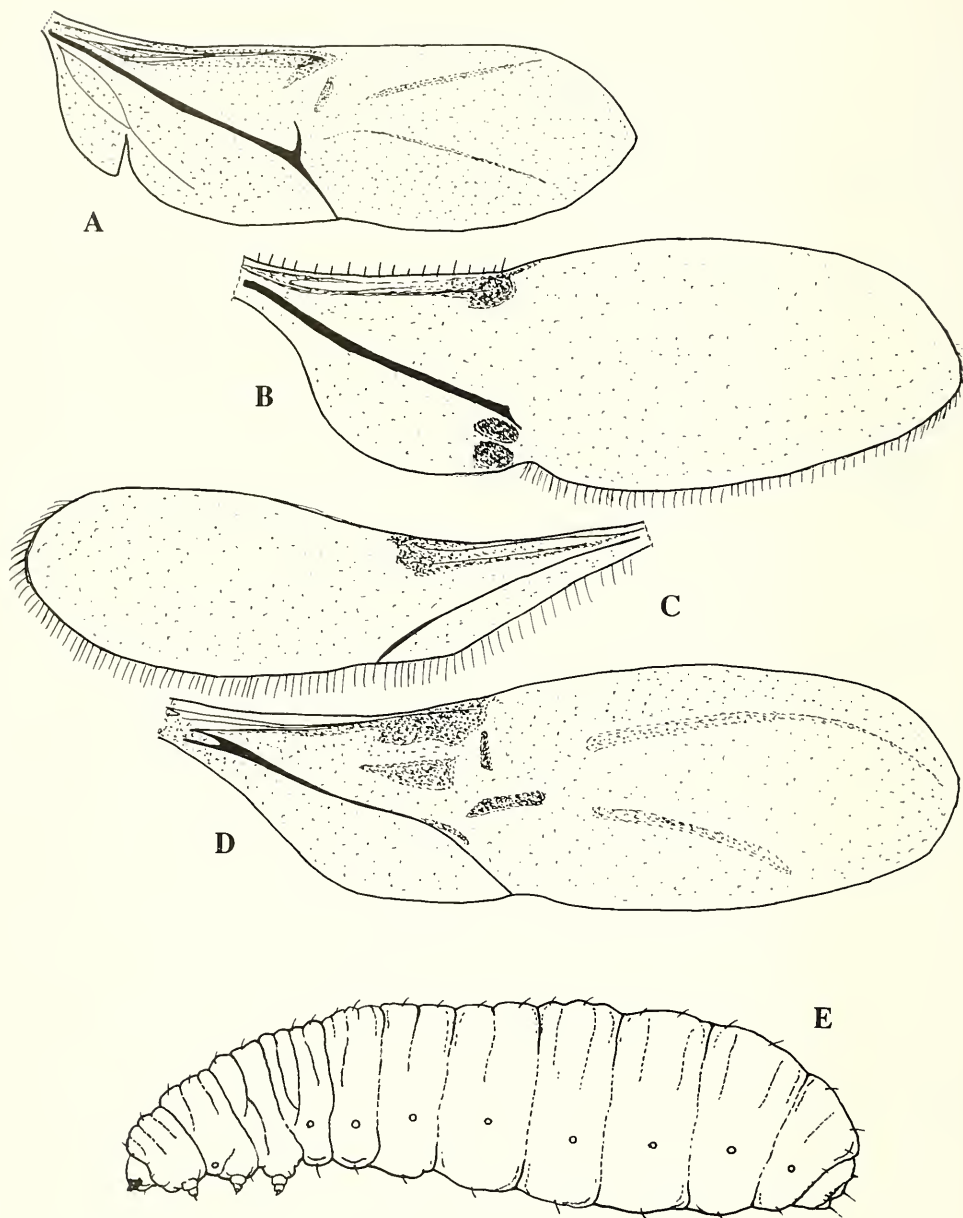


Fig. 6. A-D - wing; a - *Metacerylon parallelum*; b - *Murmidiu* sp.; c - *Ostomopsis neotropicalis*; d - *Oroussetia* sp.; e - *Bothrioderes contractus*, mature larva (after Negru).

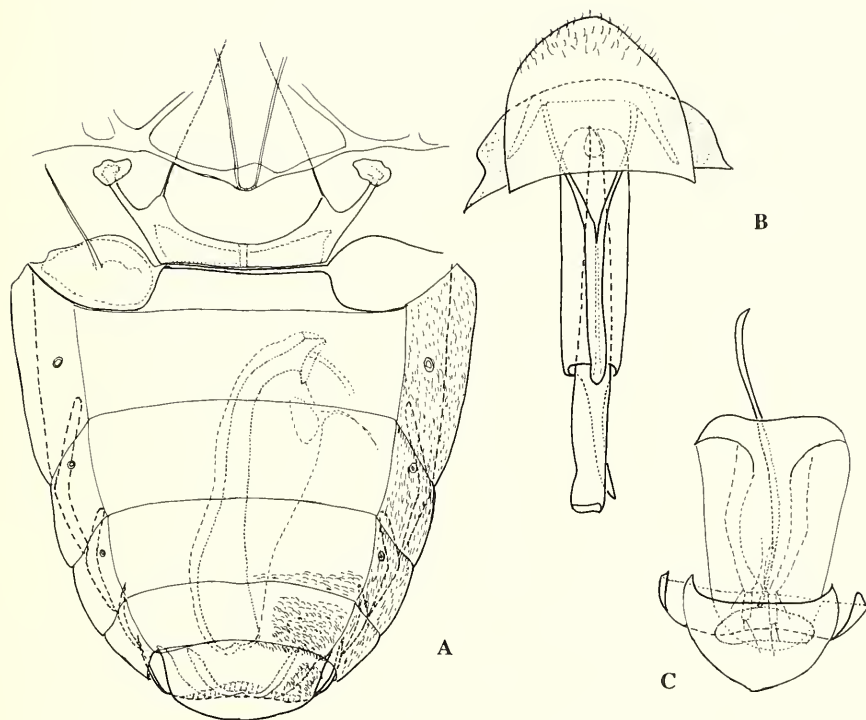


Fig. 7. a - *Cerylon histeroides*, male abdomen, and part of metathorax, dorsal (abdominal terga I, II removed); b - *Murmidius ovalis*, male terminalia, ventral; c - *Cerylon histeroides* - female terminalia, dorsal.

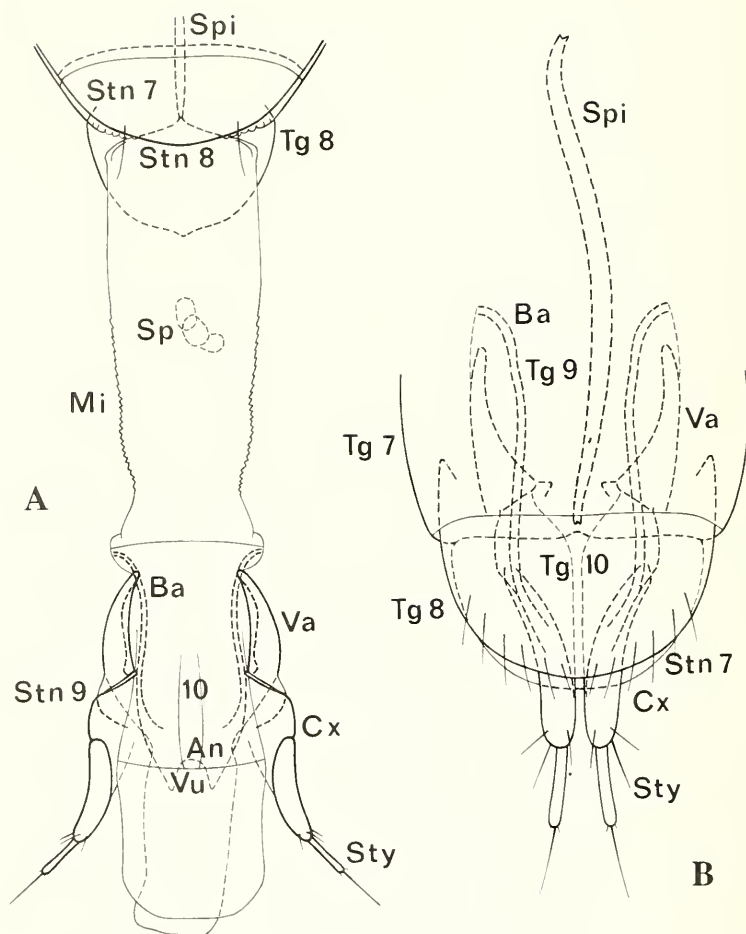


Fig. 8. a - *Cautomus convexus*, female terminale exerted; b - *Cautomus sugerens*, female terminalia. an - anus; ba - baculi; cx - coxites; mi - membrane; sp - spermatheca; spi - spiculum gastrale; stn7 ...10 sterna; sty - stylus; tg7 ...10 - terga; va - Valvifer; vu - vulva.

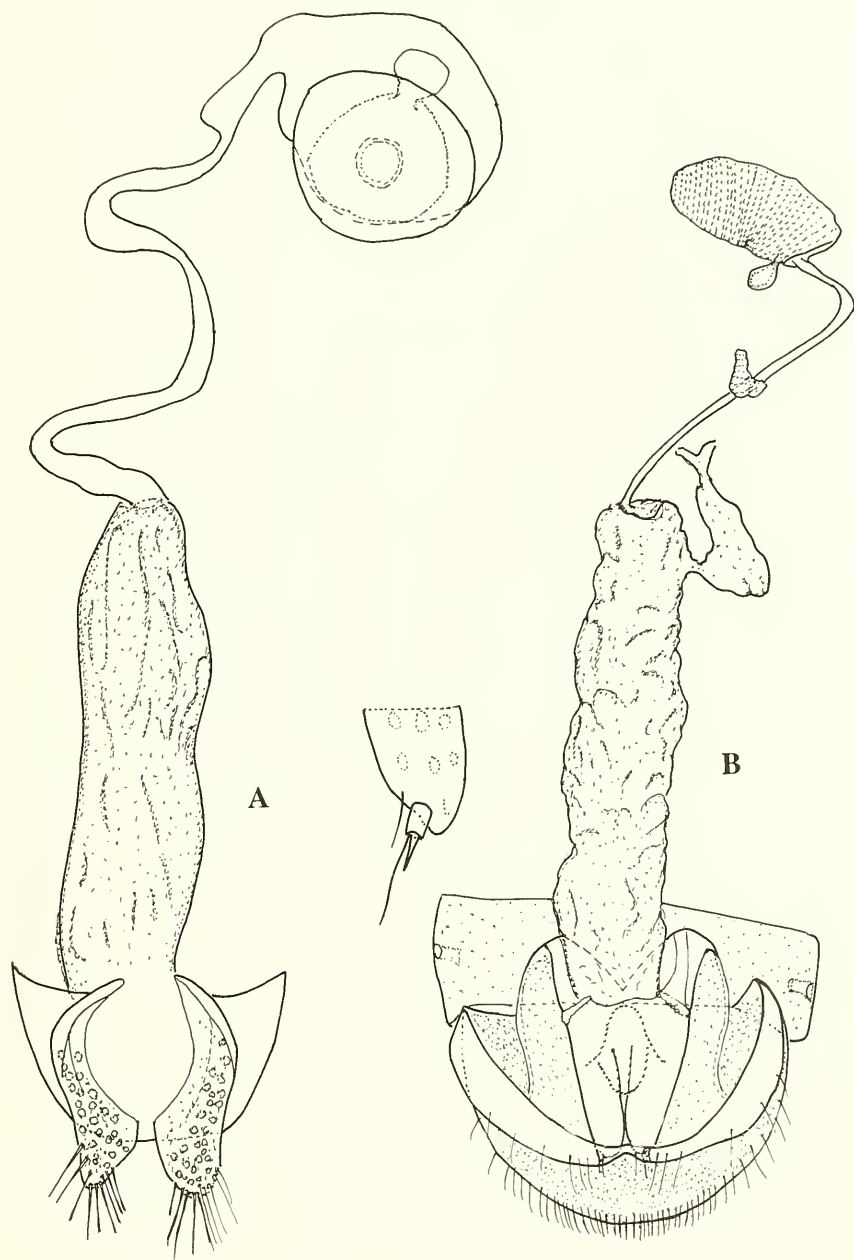


Fig. 9. a - *Murmidius ovalis*, female genitalia; b - same of *Metacerylon parallellum*, detail: magnificated stylus.

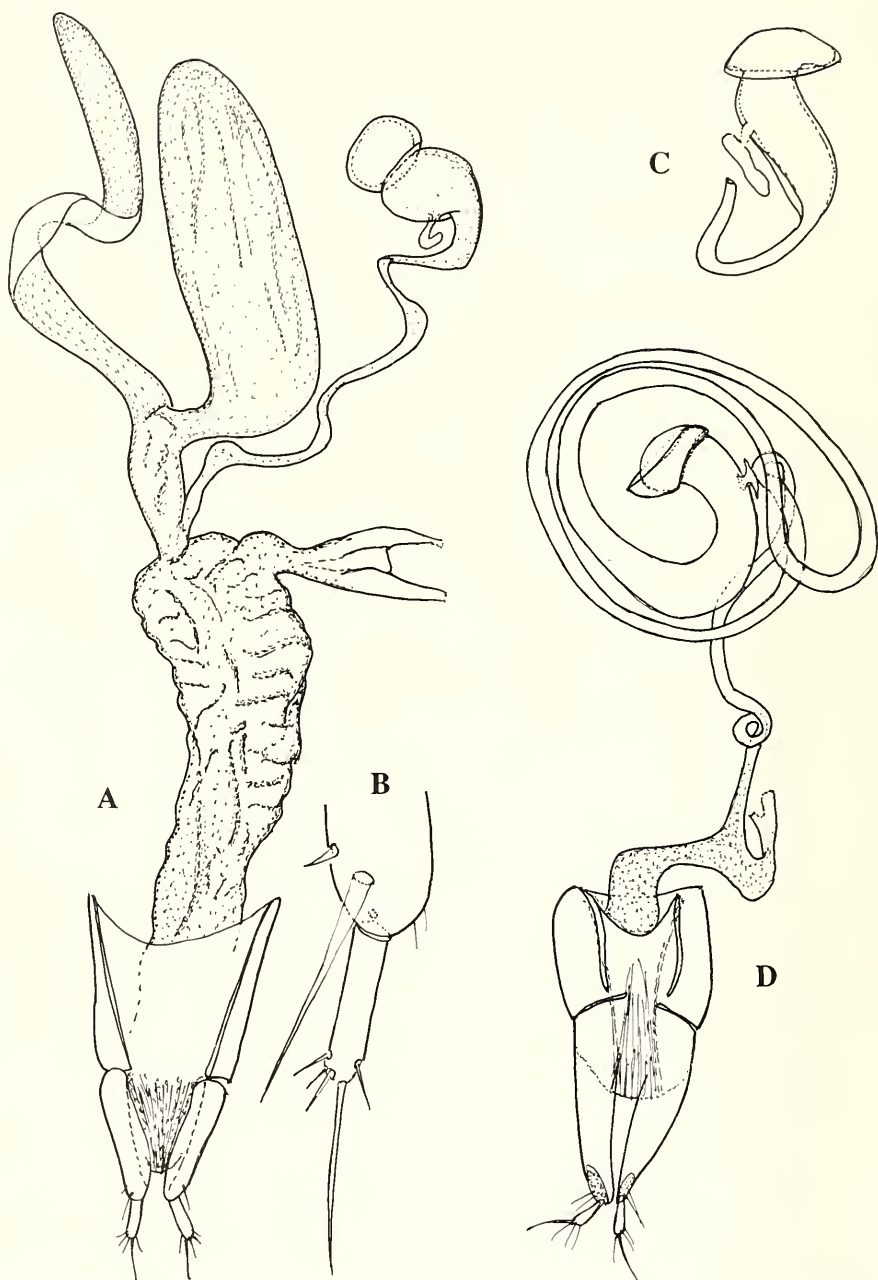


Fig. 10. Female terminalia; a-b - *Cerylon histeroideus*; c - *Cycloxenus hispidus*, spermatheca; d - *Euxestoxenus* sp.

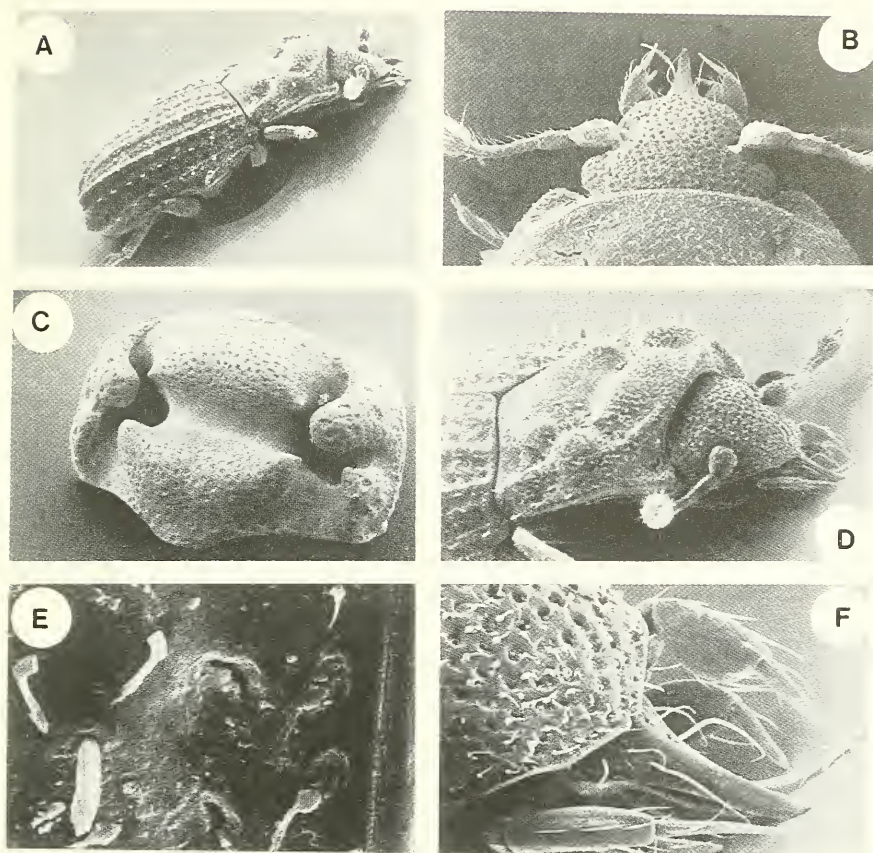


Fig. 11. *Axiocerylon setulosum*: a - laterodorsal view; b - head and anterior part of prothorax; c - prothorax, dorsal; d - head and prothorax, laterodorsal view; e - elytral sculpture; f - mouth-parts, lateral view.

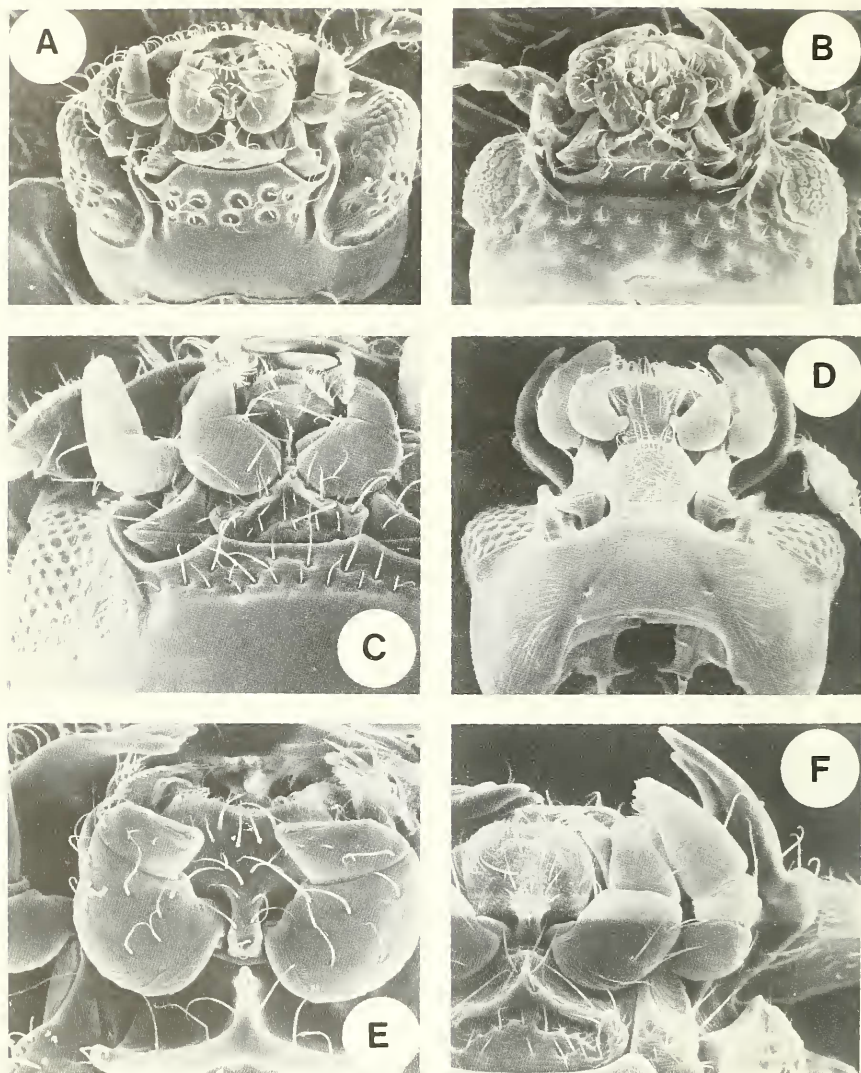


Fig. 12. Head structures, ventral. a, e - *Globoeuxestus*; b - *Ostomopsis*; c - *Metacerylon*; d - *Murmidius*; f - *Euxestoxenus*.

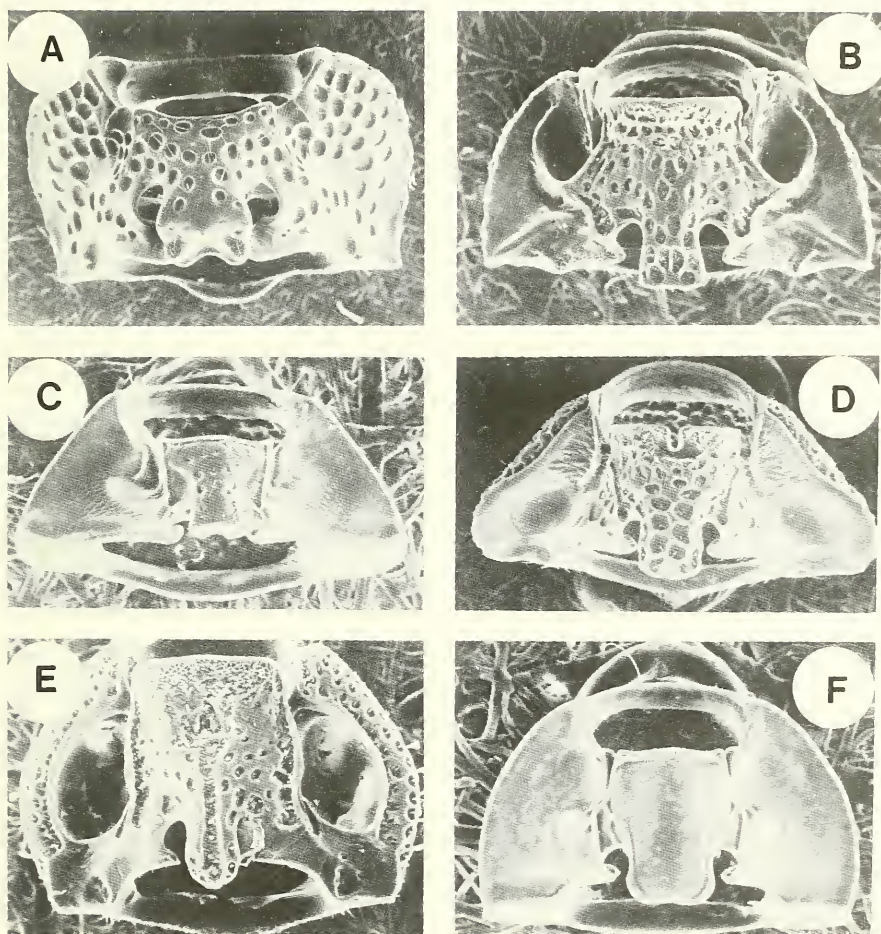


Fig. 13. Prothorax, ventral. a - *Gyreleon*; b - *Pseudolapethus*; c - *Glomerylon*; d - *Rostrorylon*; e - *Thyroderus*; f - *Lapethinus*.

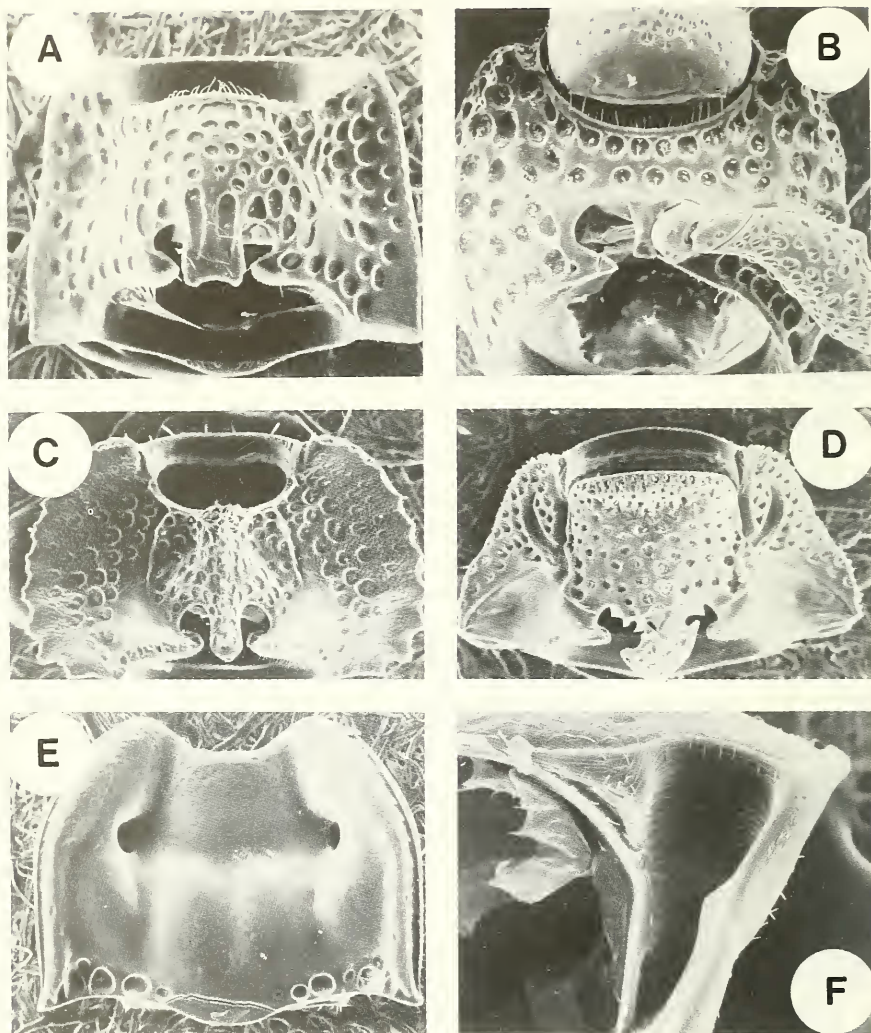


Fig. 14. Protothorax. a-d, ventral view; e - dorsal; f - anterior view. a - *Belingaia*; b - *Loebliorylon*; c - *Cautomus*; d - *Angolon*; e - *Suakokoia*; f - *Murmidius*, antennal cavity.

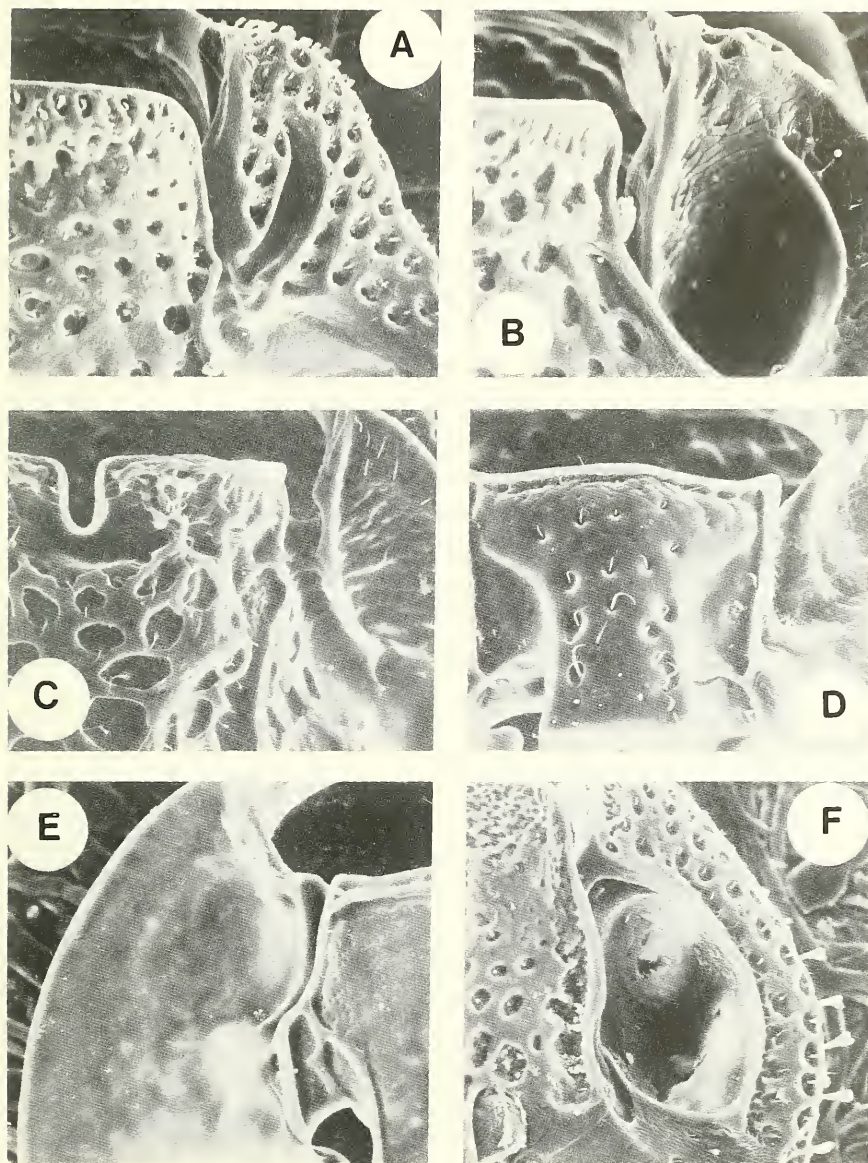


Fig. 15. Prothorax, ventral view, details of antennal groove and cavities. a - *Angolon*; b - *Pseudolapethus*; c - *Rostrorylon*; d - *Glomerylon*; e - *Lapethinus*; f - *Thyroderus*.

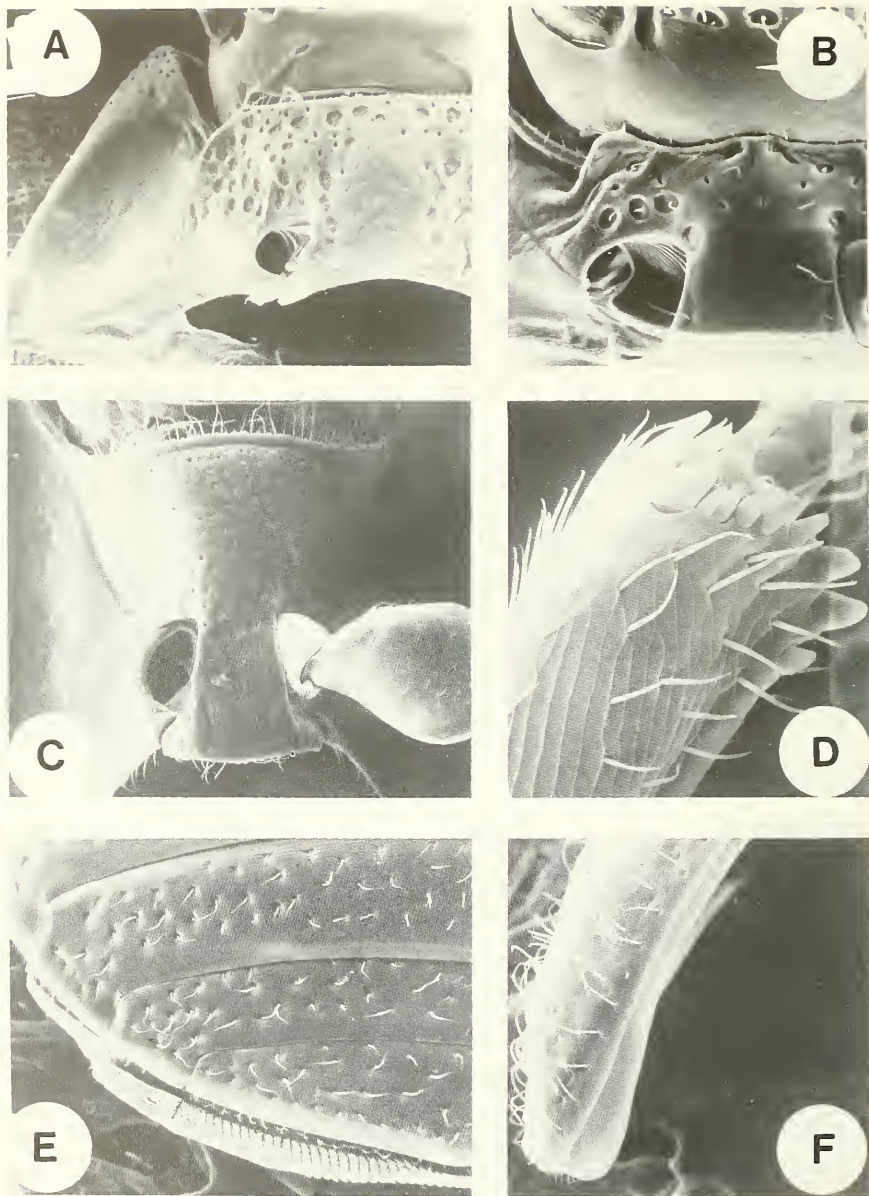


Fig. 16. a - *Euxestoxemus*, prothorax, ventral; b - *Globoeuxestus*, prosternal process and cavity; c - *Metacerylon*, prosternum; d - *Metacerylon parallelum* protibial apex; e - *Murmidius ovalis*, abdominal ventrites IV, V, showing crenulation; f - *Ostomopsis* - elytral apex, showing widened flange and longitudinal striation.

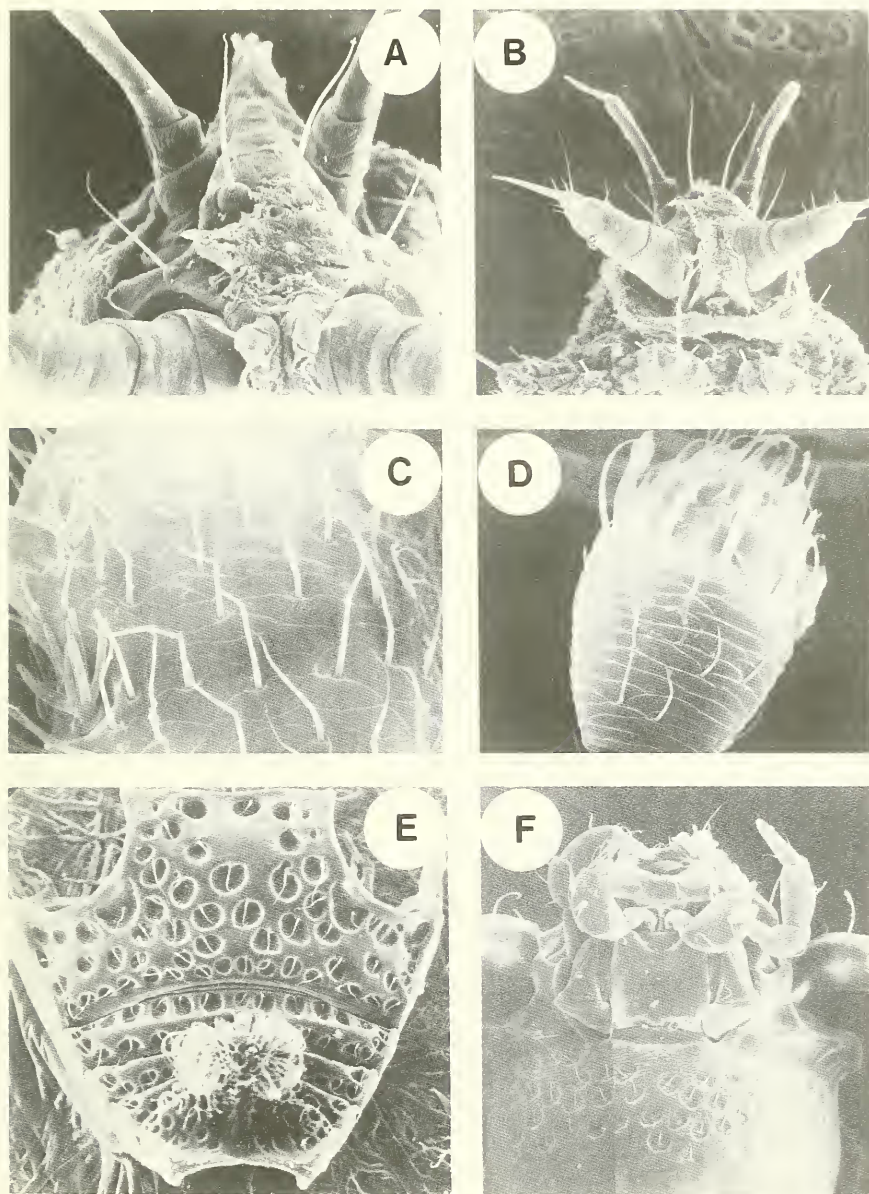


Fig. 17. a, b - cerylonine larva from Java, head, dorsal; c - *Ostomopsis*, part of antennal club showing specialized sensillum; d - *Murmidius ovalis*, antennal club; e - *Loebliorylon*, male abdomen; f - *Loebliorylon*, head, ventral.

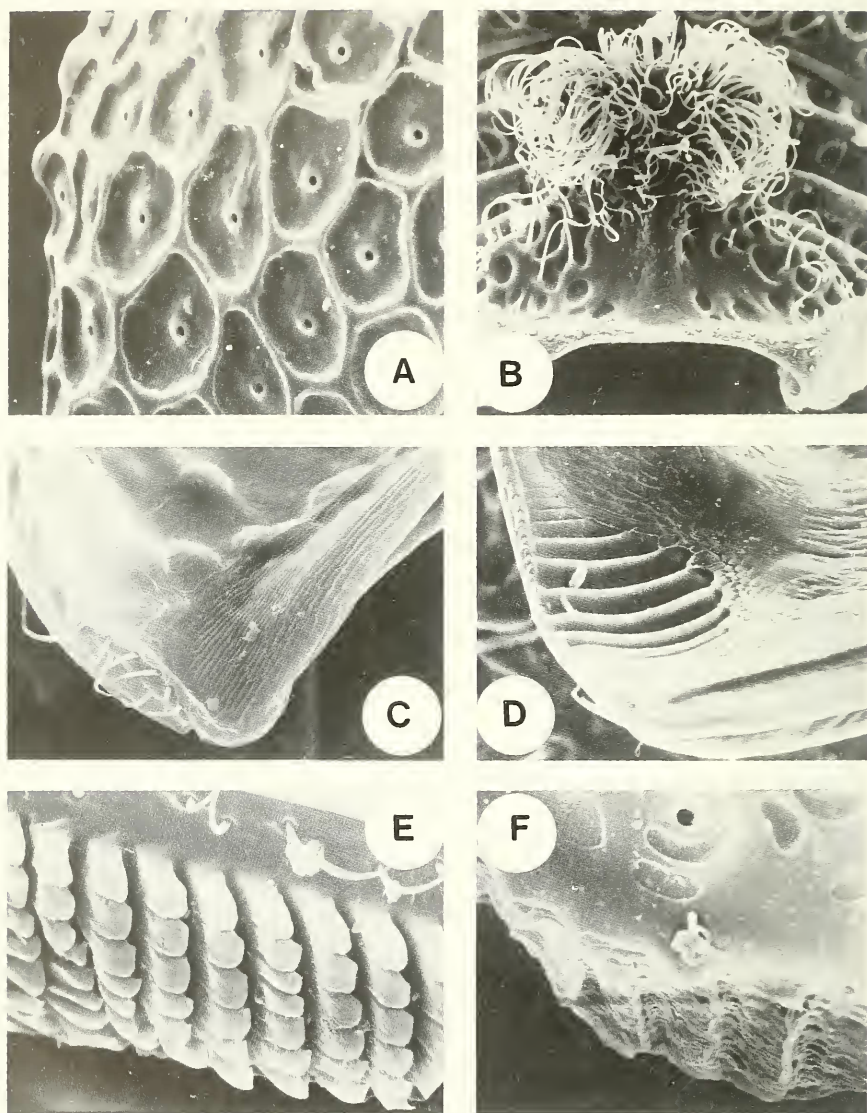


Fig. 18. a - *Ectomicrus*, pronotal punctation, in lateral part; b - *Loebliorylon*, male last abdominal ventrite from behind; c - *Ostomopsis*, apical part of elytra, ventral showing longitudinal striation; d - *Ectomicrus*, elytral apex, ventral, showing crenulation; e - *Murnidius*, structure of crenulation along hind border of last ventrite (1200 \times); f - same of *Ectomicrus* (500 \times)

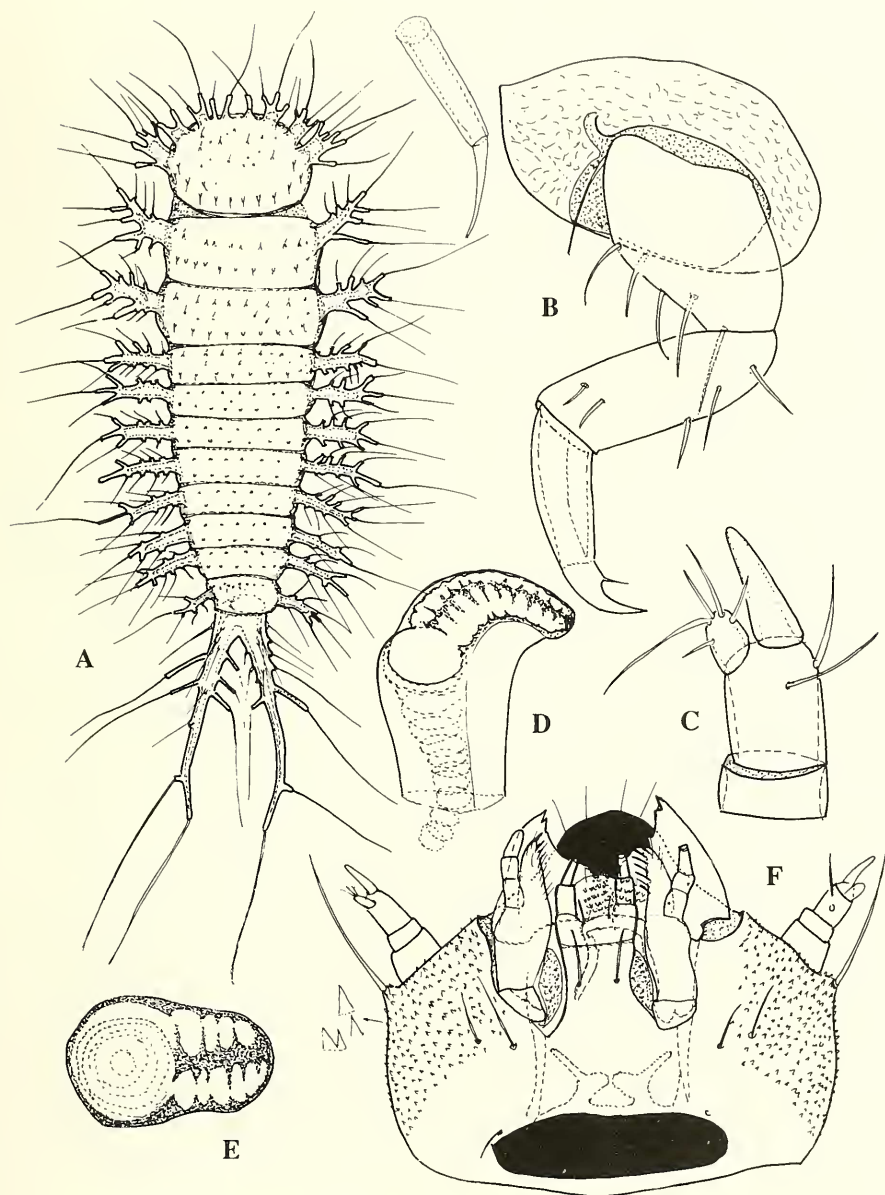


Fig. 19. *Hypodacnella* sp. (Australia): a - mature larva, dorsal view, excluding head; b - left mesothoracic leg, ventral; c - left antenna, dorsal; d - mesothoracic spiracle, dorsal-oblique view showing spiracular process; e - same, main and accessory openings, perpendicular view; f - head, ventral view.

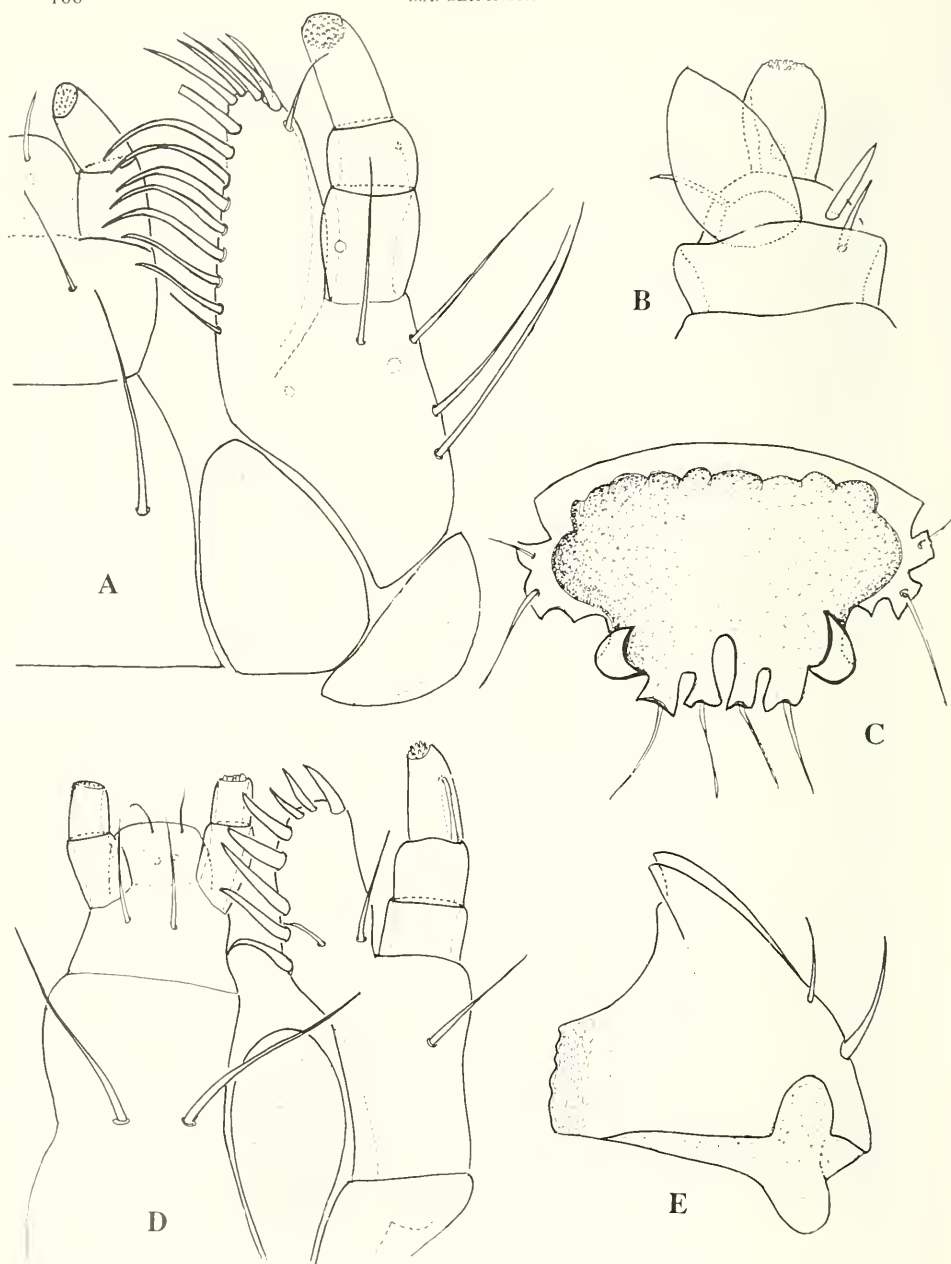


Fig. 20. a - *Hypodacnella* sp. (Australia), labium and left maxilla, ventral; b - e - *Anommatus duodecimstriatus*, larva: b - right antenna; dorsal; c - abdominal tergite IX, showing upturned urogomphi; d - labium and left maxilla, ventral; e - right mandible, dorsal.

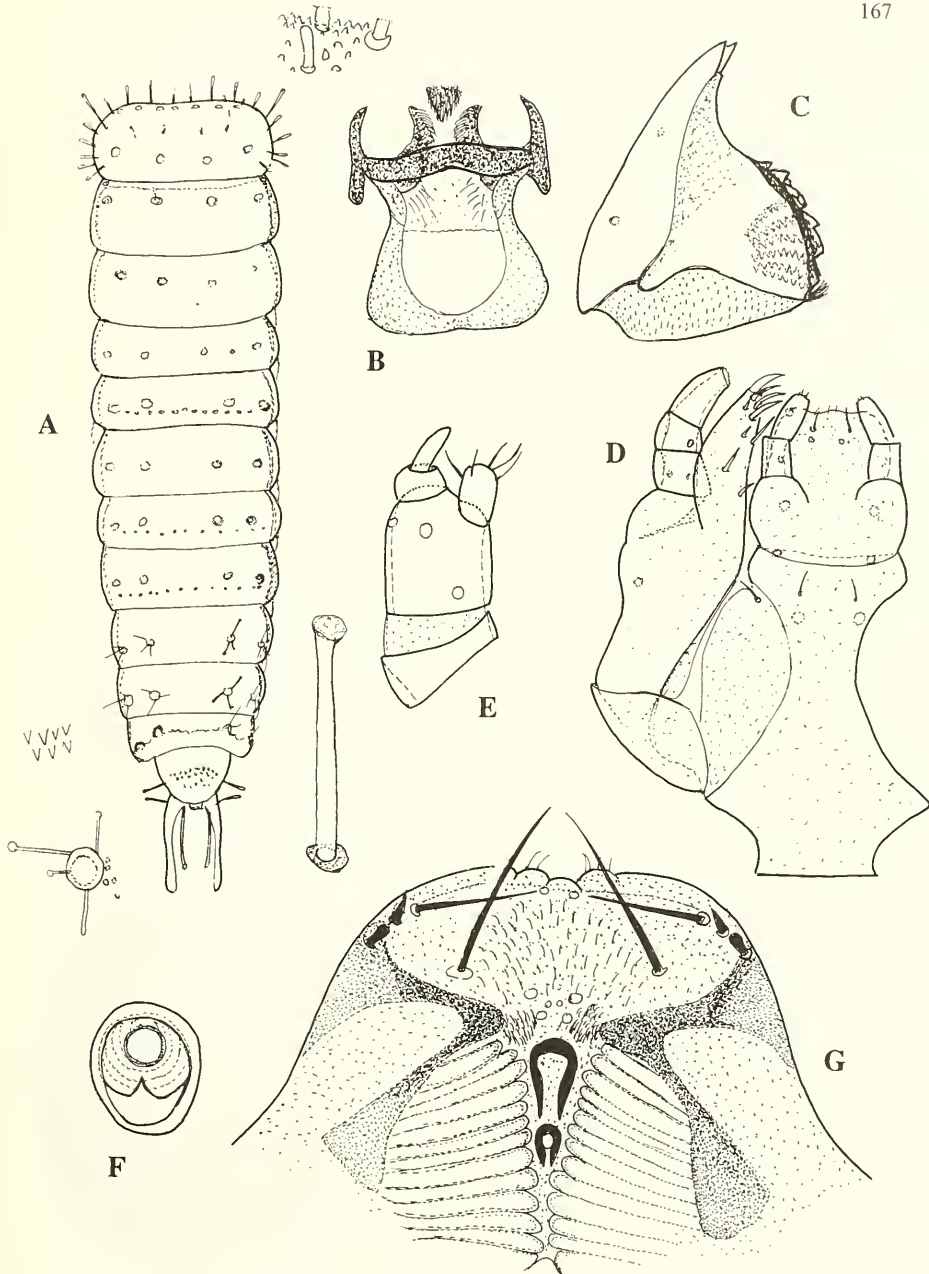


Fig. 21. *Euxestus erithacus*, mature larva (Jamaica): a - dorsal side, details show type of vestiture; b - hypopharynx; c - right mandible, ventral; d - labium and right maxilla, ventral; e - right antenna, dorsal; f - abdominal spiracle; g - labrum-epipharynx, ventral.

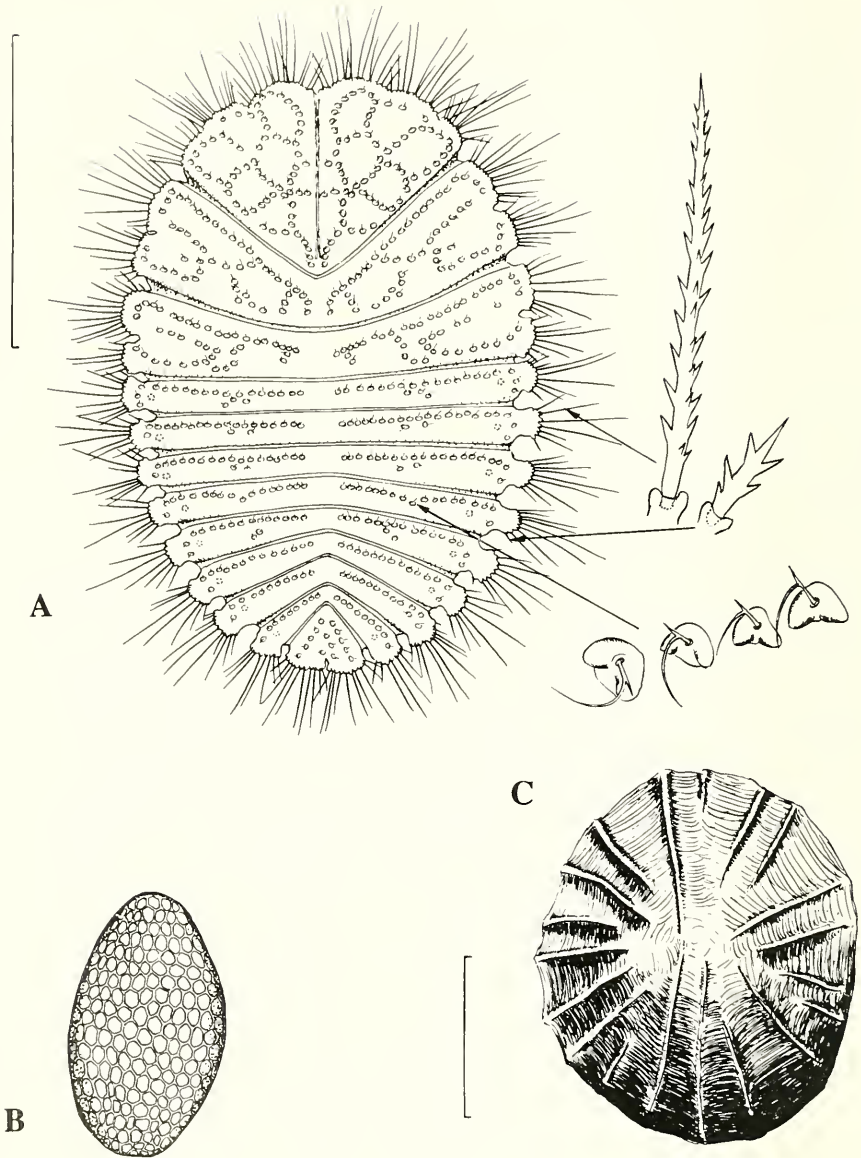


Fig. 22. *Murmidius ovalis*: a - mature larva, dorsal; b - egg; c - pupal cocoon.

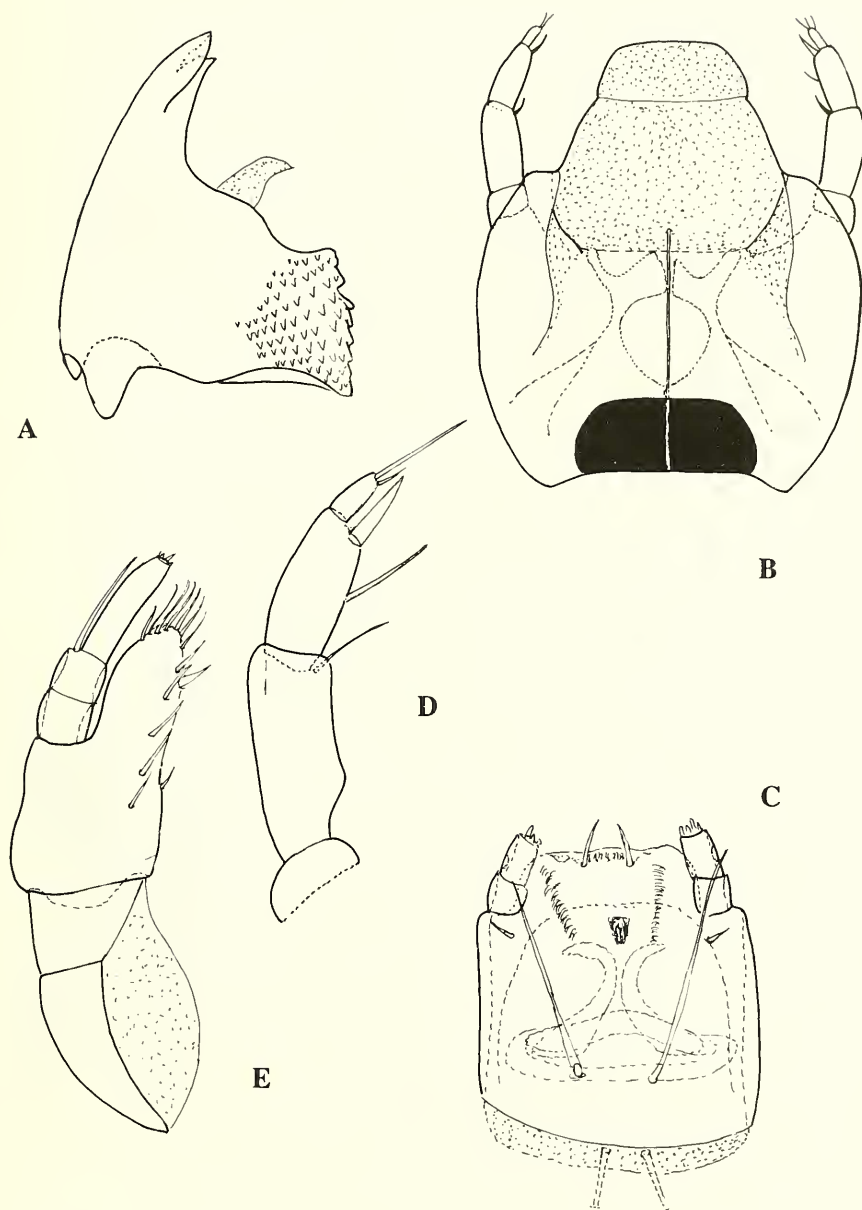


Fig. 23. *Murmidius ovalis*, mature larva; a - right mandible, ventral; b - head, ventral (mouth-parts removed); c - labium and hypopharynx, ventral; d - right antennomere, ventral; e - right maxilla, ventral.

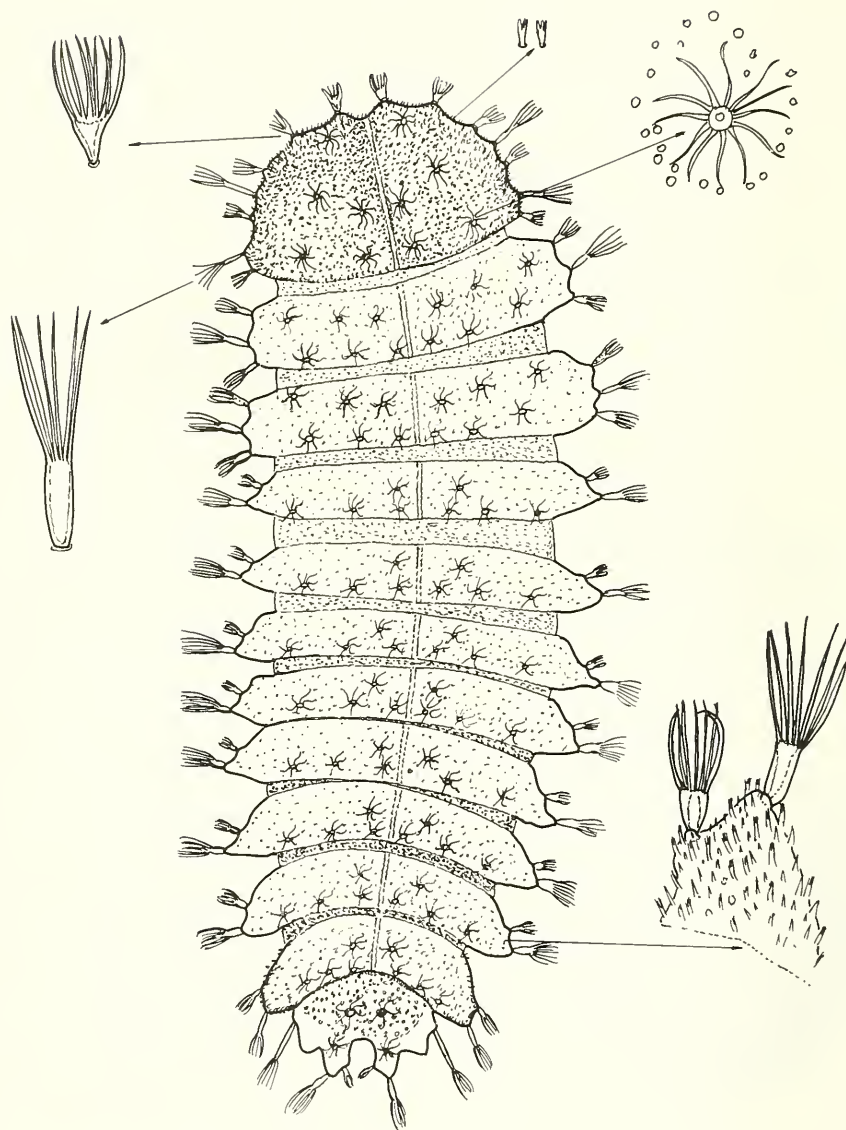


Fig. 24. *Philothermus glabriculus*, mature larva, dorsal (head omitted).

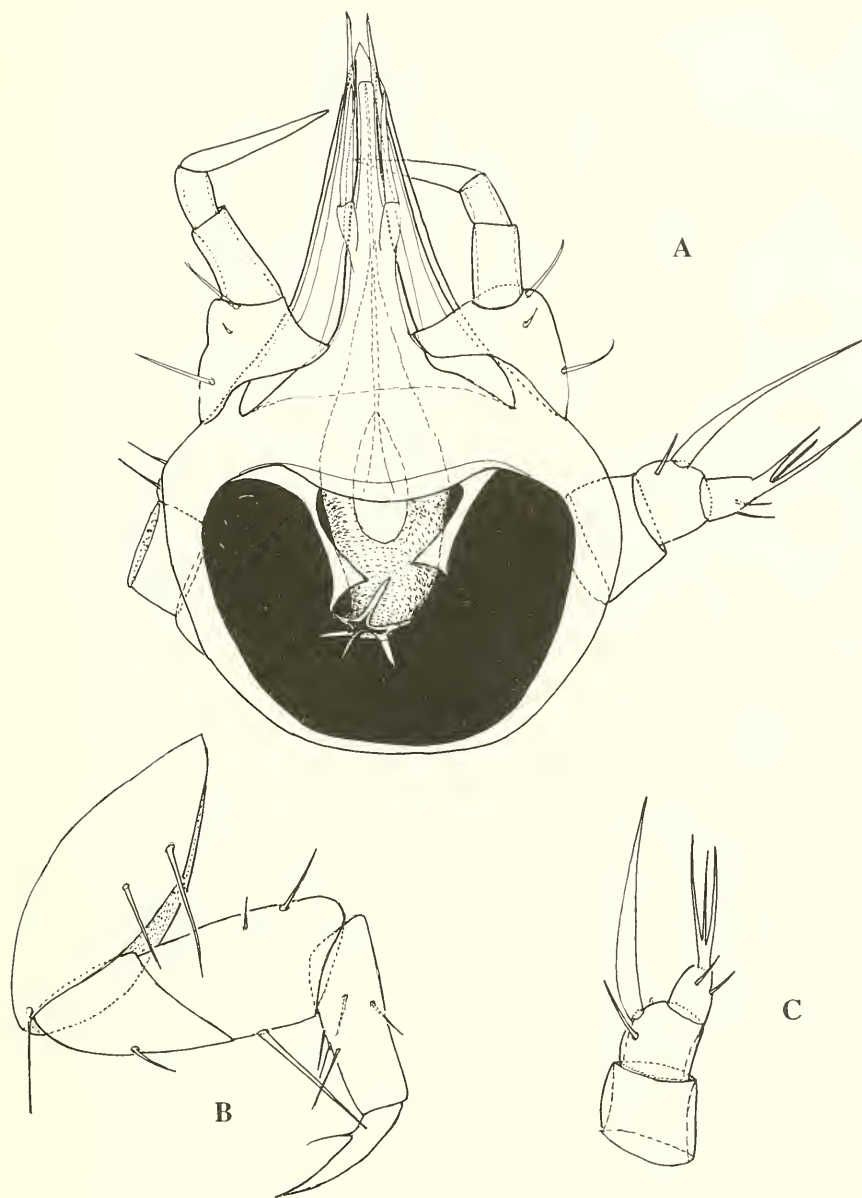


Fig. 25. *Philothermus glabriculus*, mature larva: a - head, ventral; b - prothoracic leg, ventral; c - left antenna, ventral.

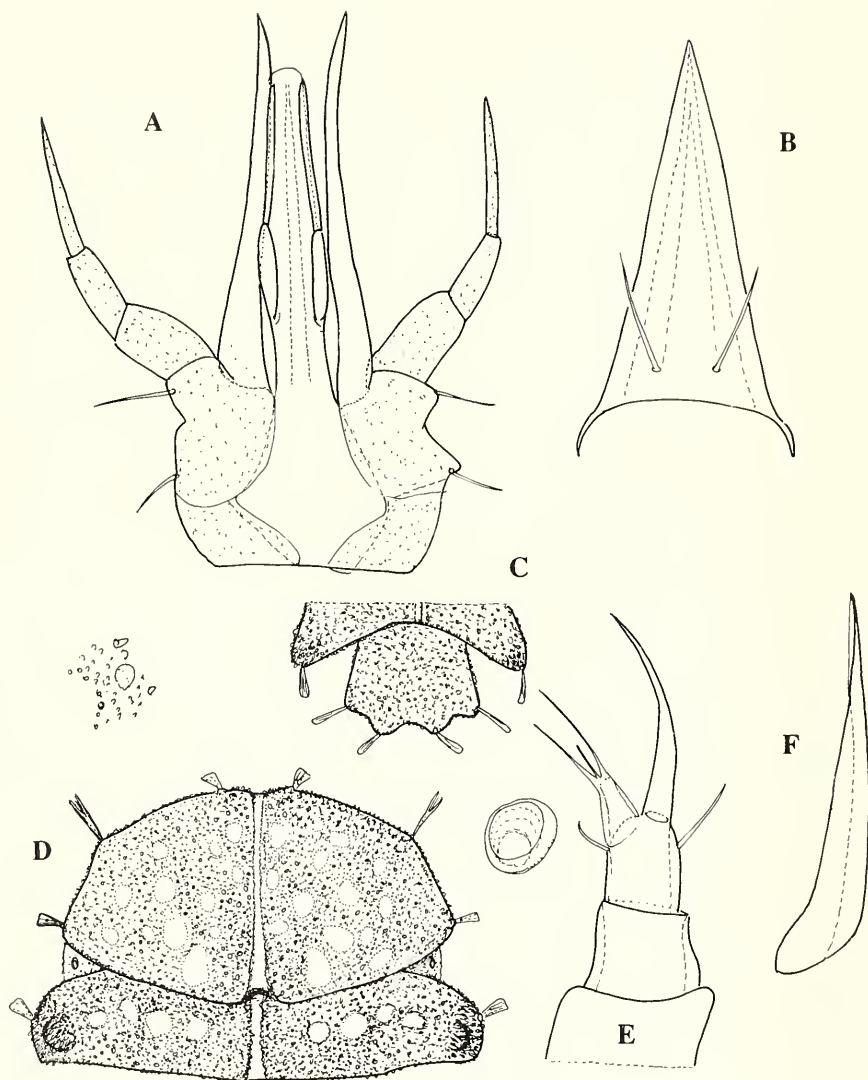


Fig. 26. *Mychocerus hintoni*, mature larva: a - labium and maxillae, ventral; b - labrum, dorsal; c - abdominal terga VIII-IX; d - pro- and meso thorax, dorsal (details show, vestiture and spiracle); e - right antenna, dorsal; f - right mandible, ventral.

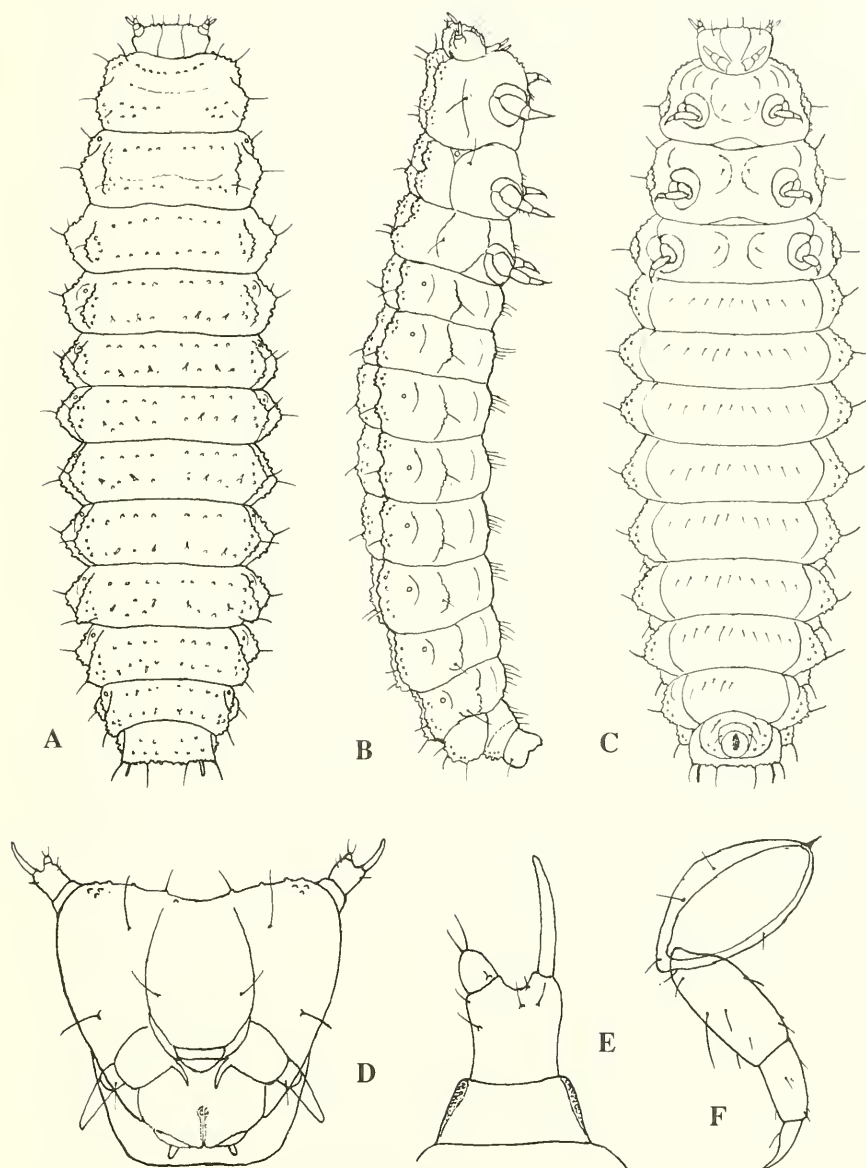


Fig. 27. *Cerylon histeroides*, mature larva: a - dorsal view; b - lateral view; c - ventral view; d - head, ventral; e - right antenna, ventral; f - prothoracic leg, ventral.

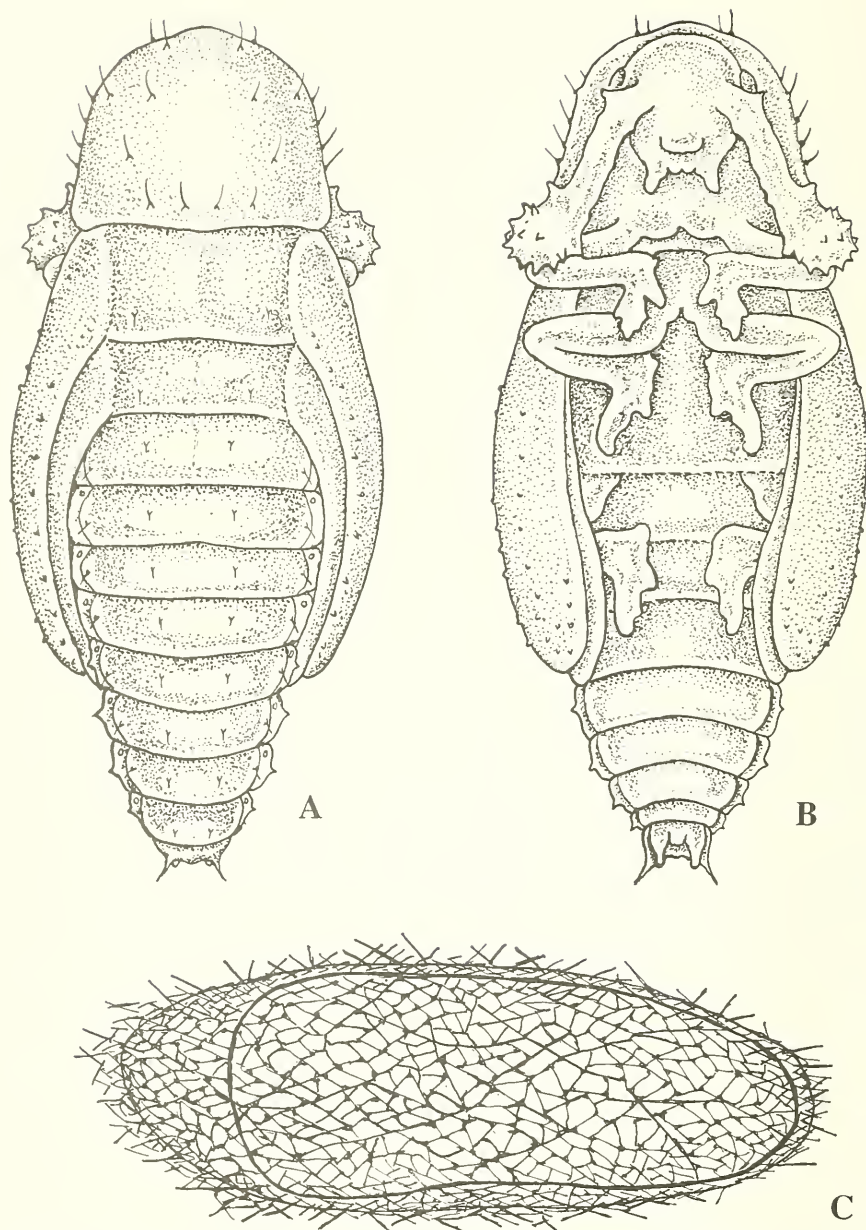


Fig. 28. *Cerylon histerooides*: a - pupa, dorsal side; b - same, ventral side; c - pupal cocoon.

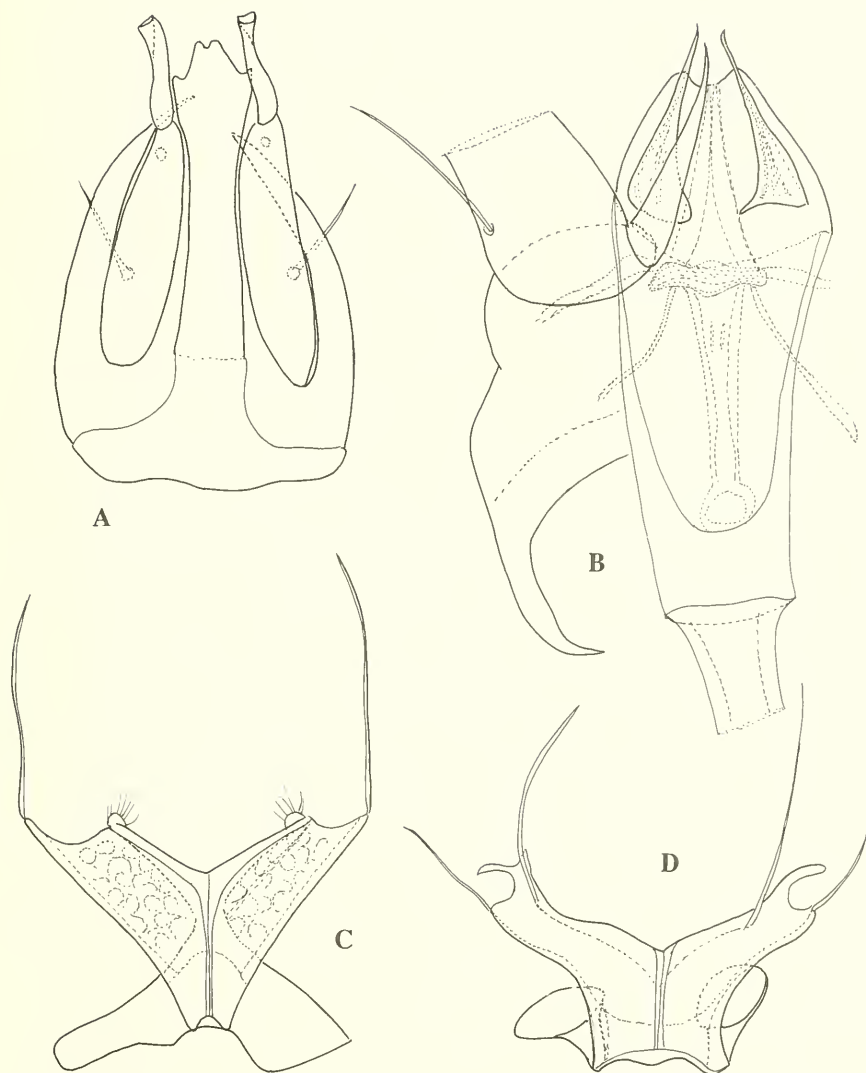


Fig. 29. a-b - Ceryloninae larva from Java: a - labium ventral; b - pharynx, mandibles, and parts of maxilla, ventral. c-d - adult metendosternites, dorsal: c - *Loebliorylon*; d - *Metacerylon parallelus*.

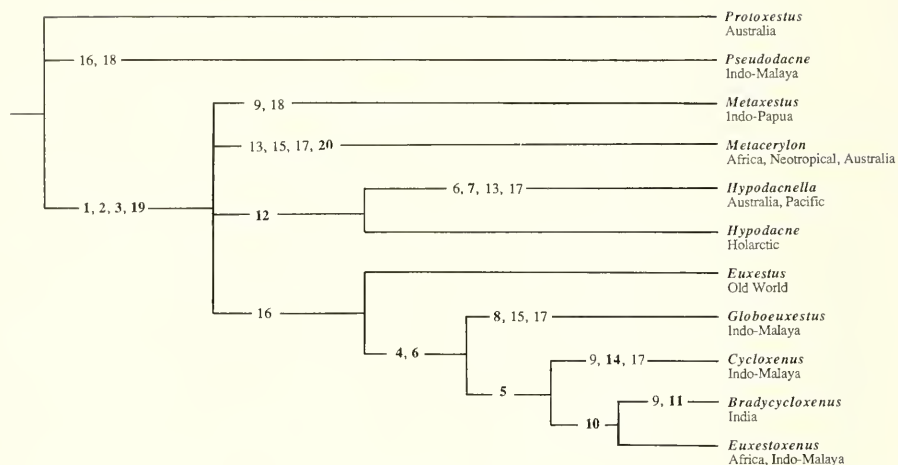


Fig. 30. Hypothesized cladistic relationships among genera of Euxestinae.

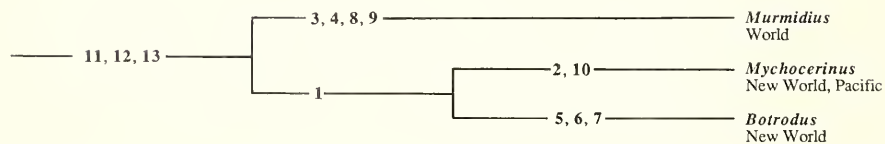


Fig. 31. Hypothesized cladistic relationships among genera of Murmidiinae.

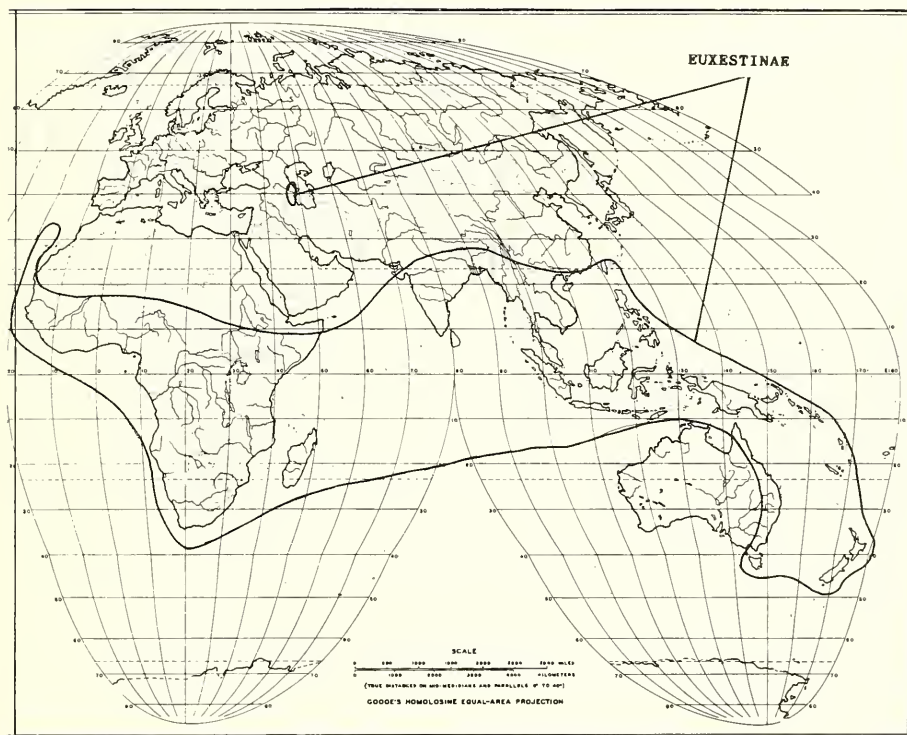


Fig. 32. Distribution of Euxestinae in the Old World (subcosmopolitan *E. erithacus* in Europe and Japan omitted).



Fig. 33. Distribution of Euxestinae in the New World (introduced *E. erithacus* omitted).

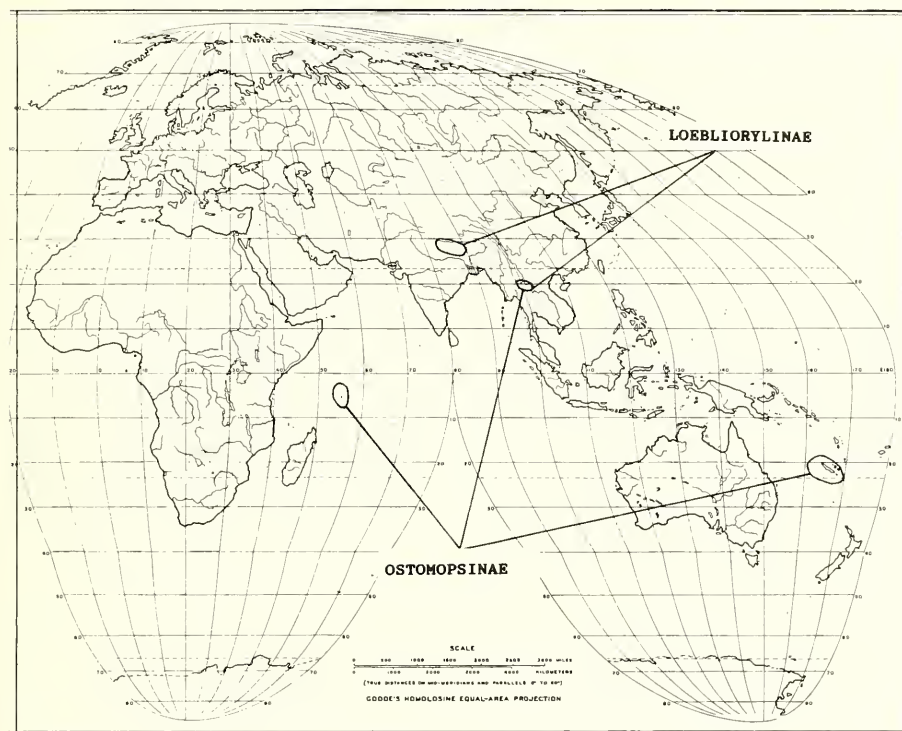


Fig. 34. Distribution of Loebliorylinae and Ostomopsinae in the Old World.

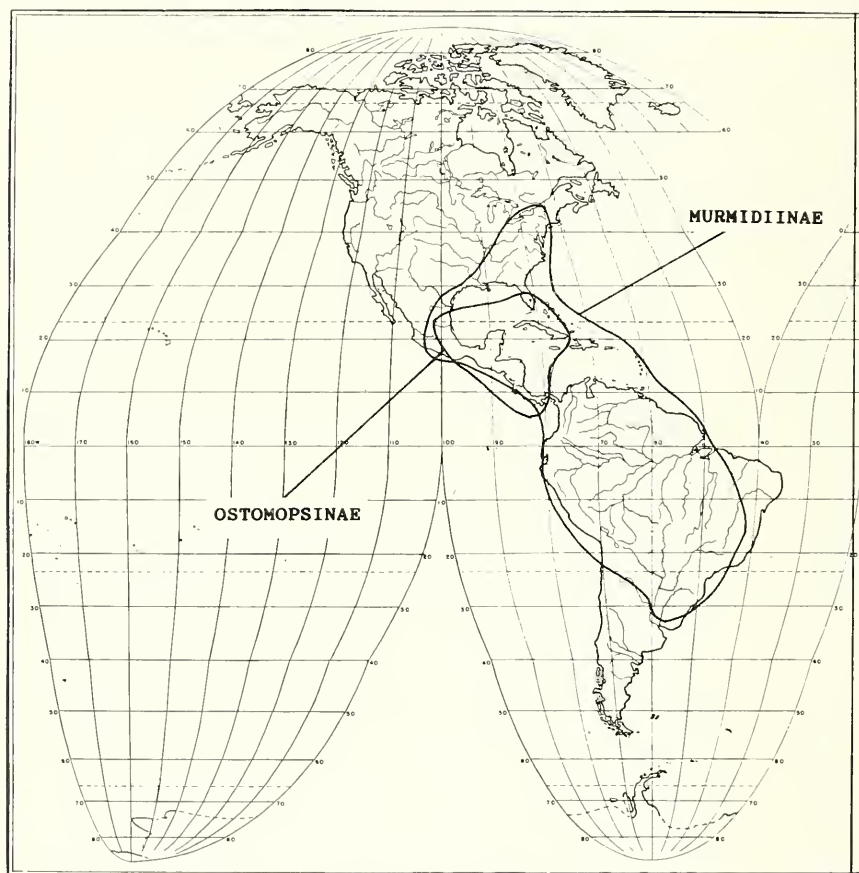


Fig. 35. Distribution of Ostomopsinae and Murnidiinae in the New World.

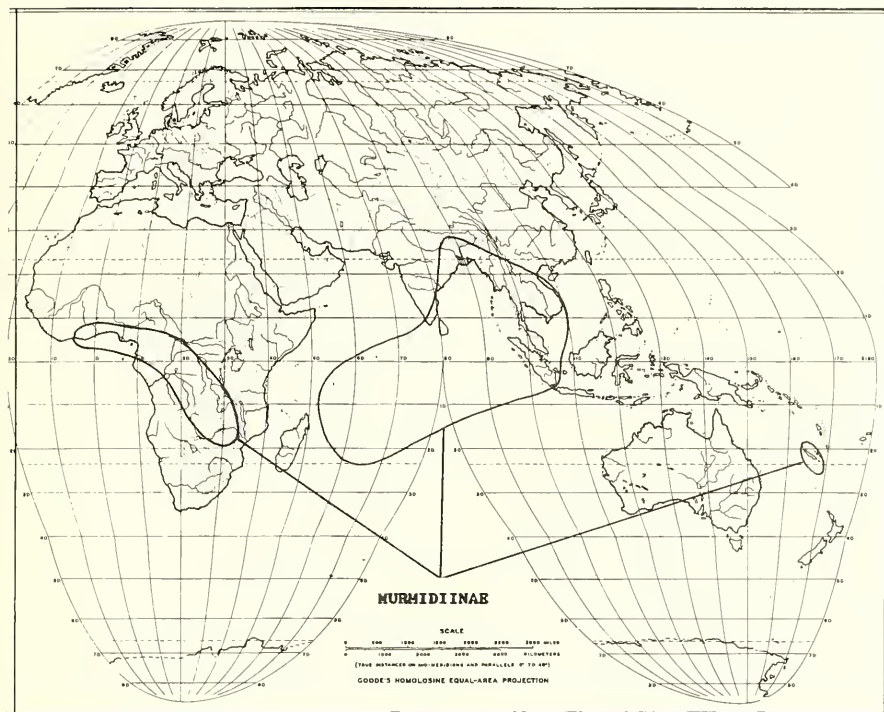


Fig. 36. Distribution of Murmidiinae in the Old World (introductions to Europe, Australia and Japan omitted).

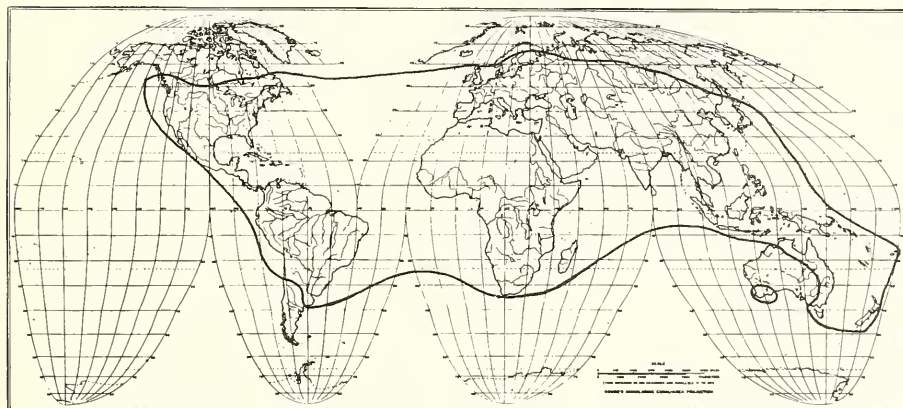


Fig. 37. Approximate range of distribution of Ceryloninae.

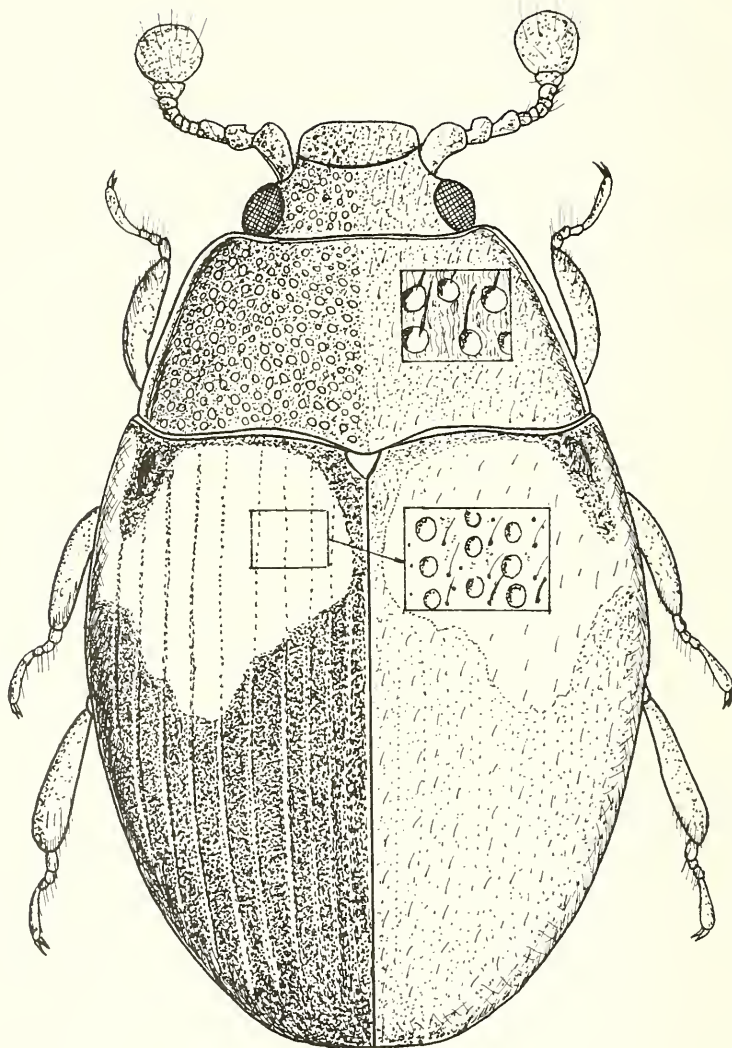


Fig. 38. *Hypodacnella kasiae* Slipinski.

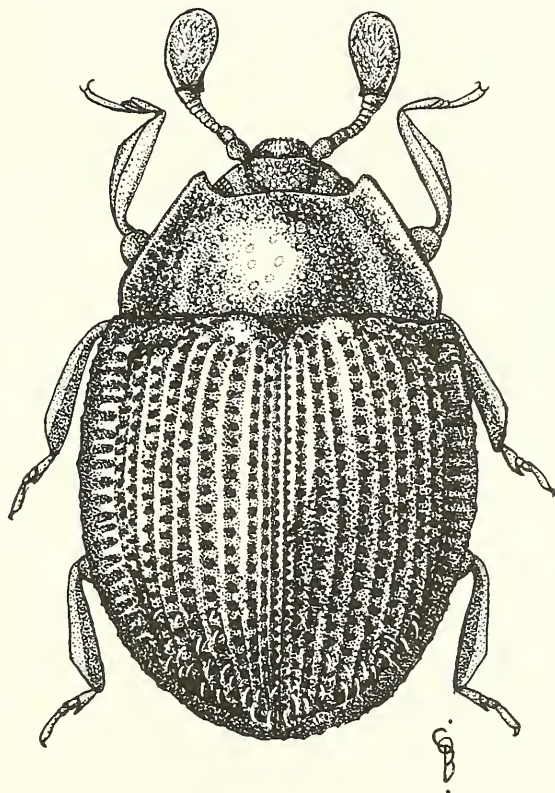


Fig. 39. *Euxestoxenus testudo* Arrow, by C.A. O'Brien.

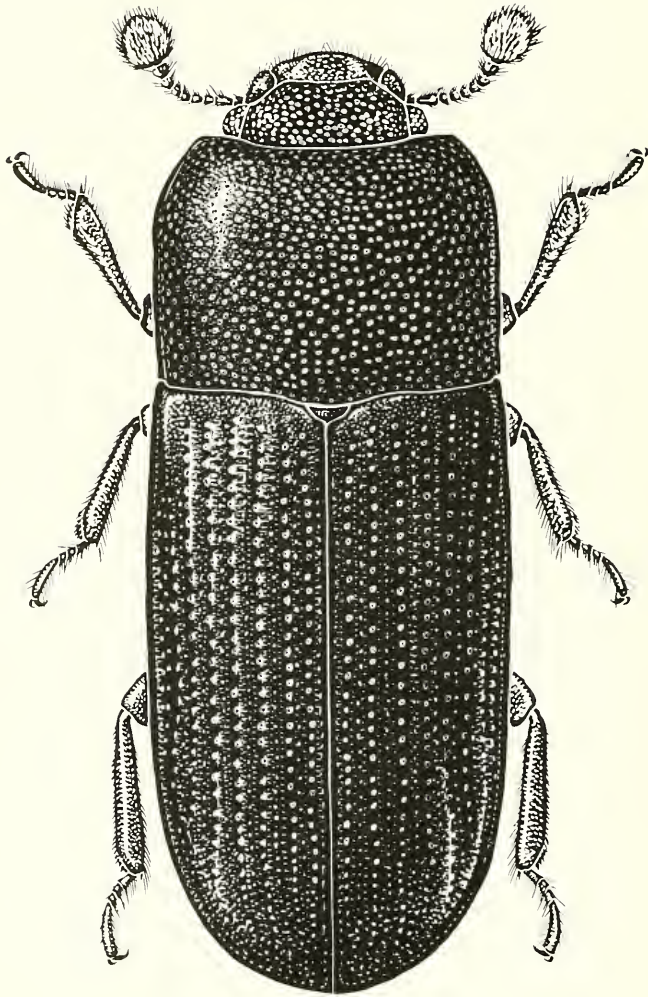


Fig. 40. *Metacerylon minutus* (Carter), by S. Monteith.

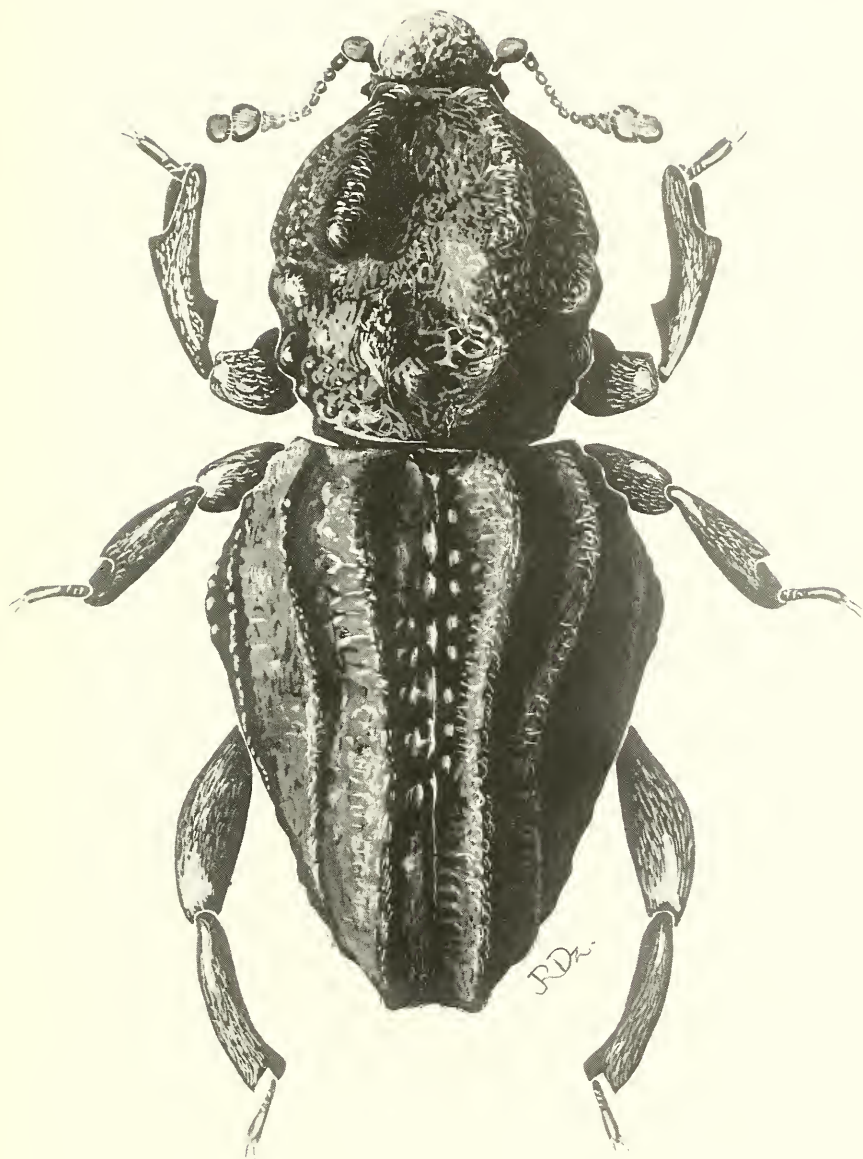


Fig. 41. *Loebliorylon carinatus* sp. n., by R. Dzwonkowski.

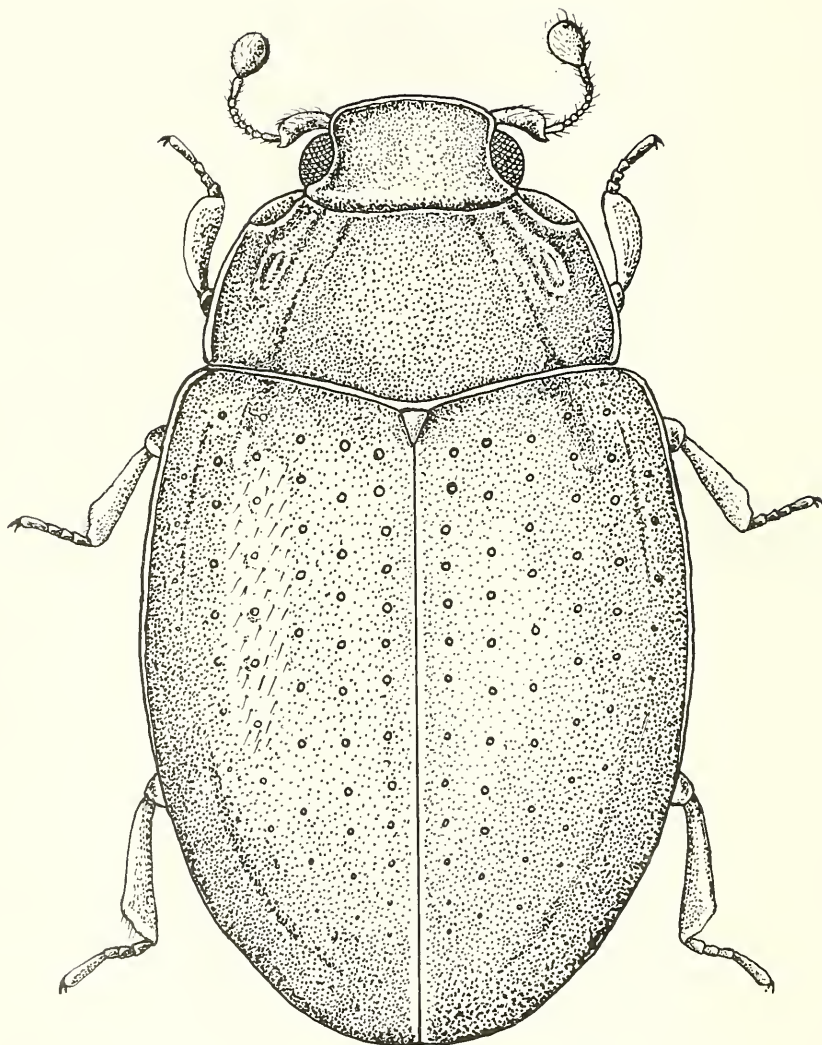


Fig. 42. *Murmidius ovalis* (Beck), by B. Burakowski.

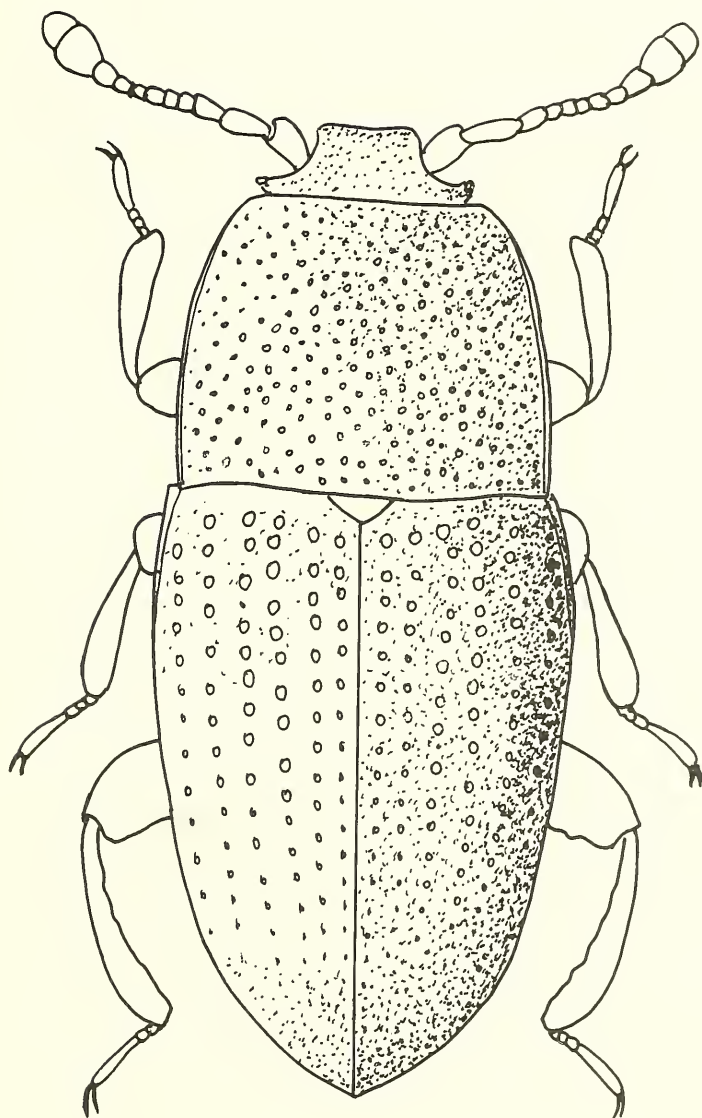


Fig. 43. *Philothermus pakistanicus* Slipinski.

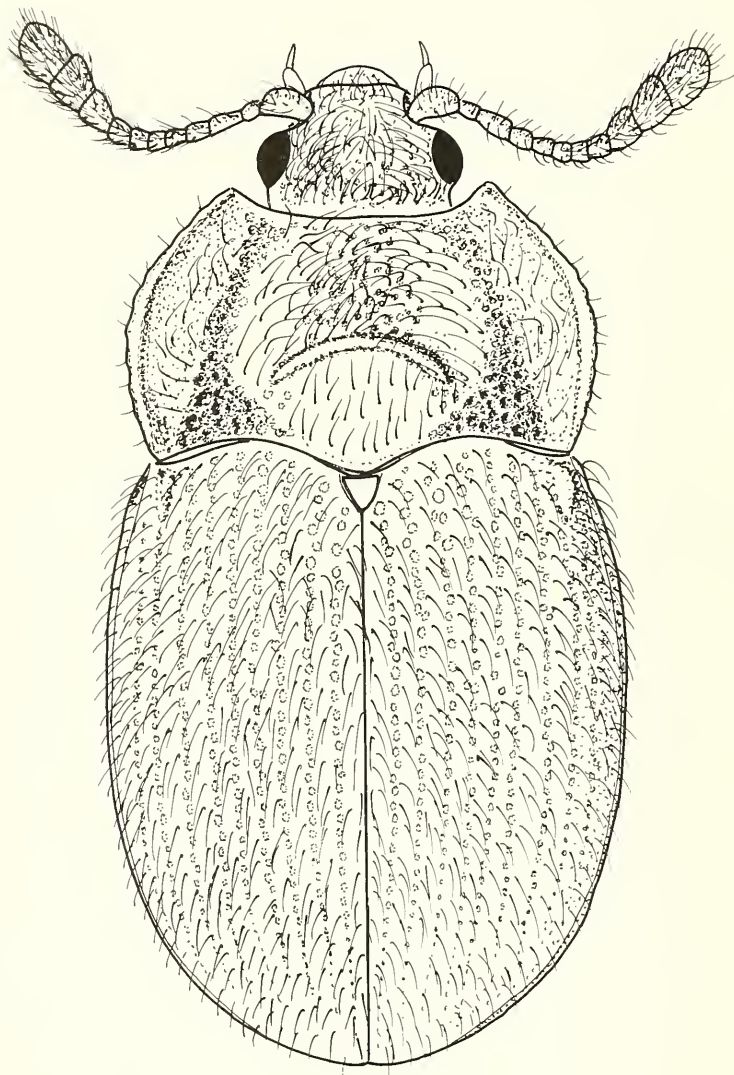


Fig. 44. *Pakalukia napo* sp. n.

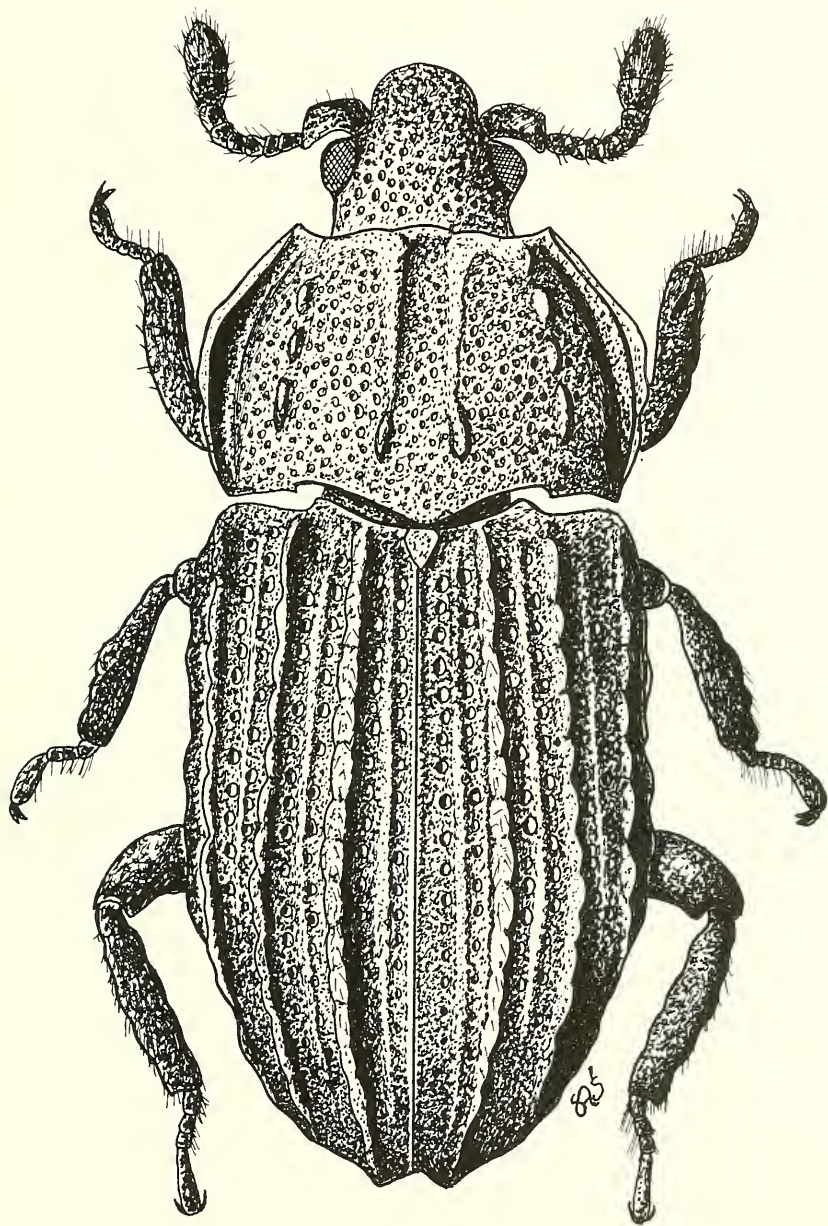


Fig. 45. *Glyptolopus histeroides* Pascoe.

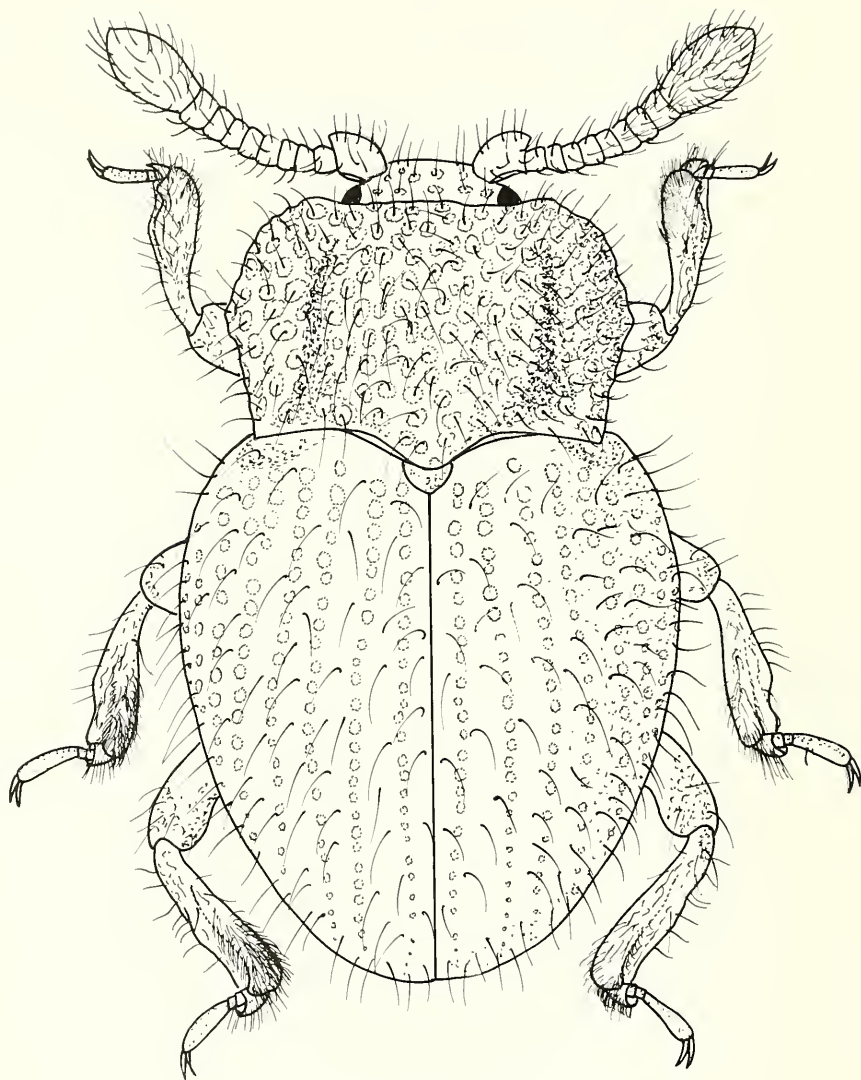


Fig. 46. *Gyreleon* sp. n. (Thailand).

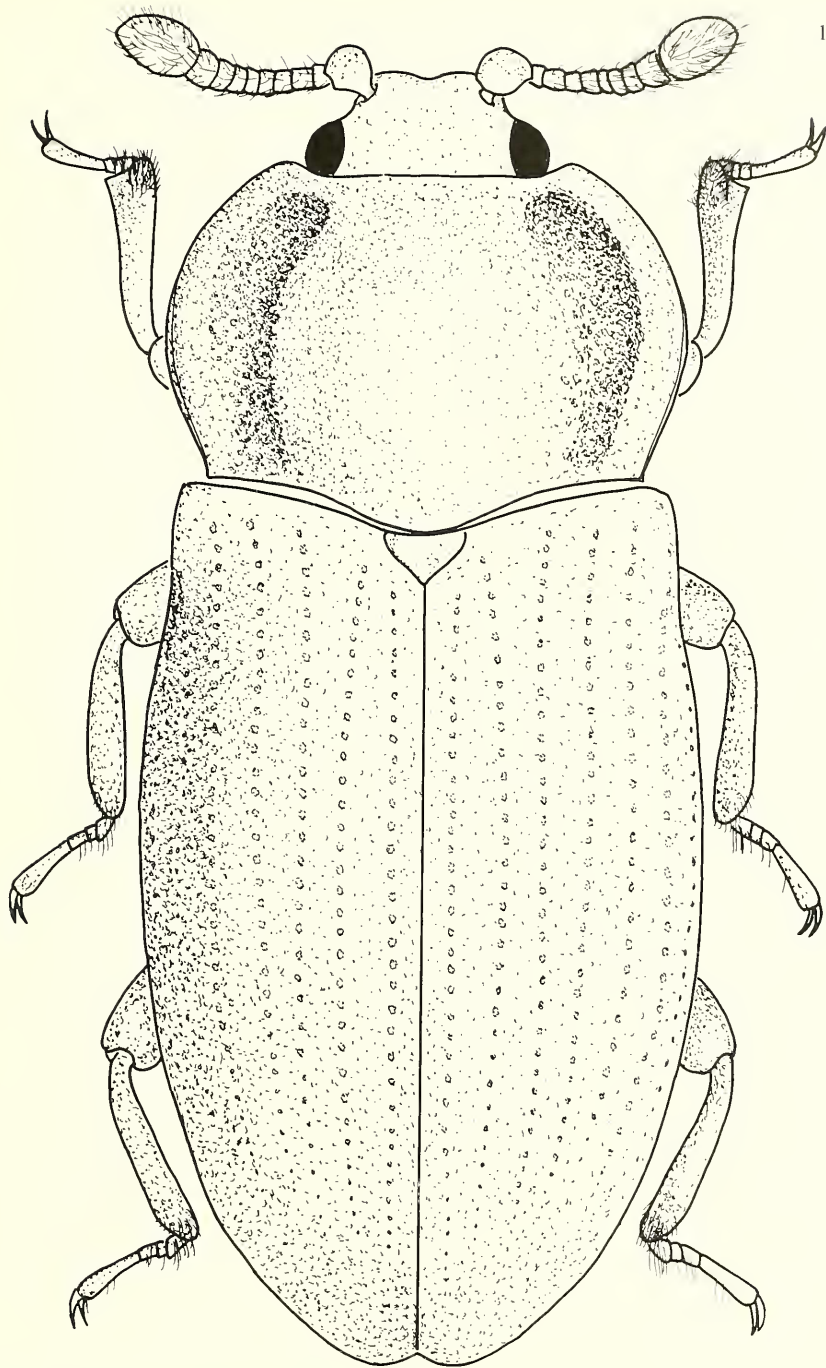


Fig. 47. *Pachylon gestroi* Grouvelle.

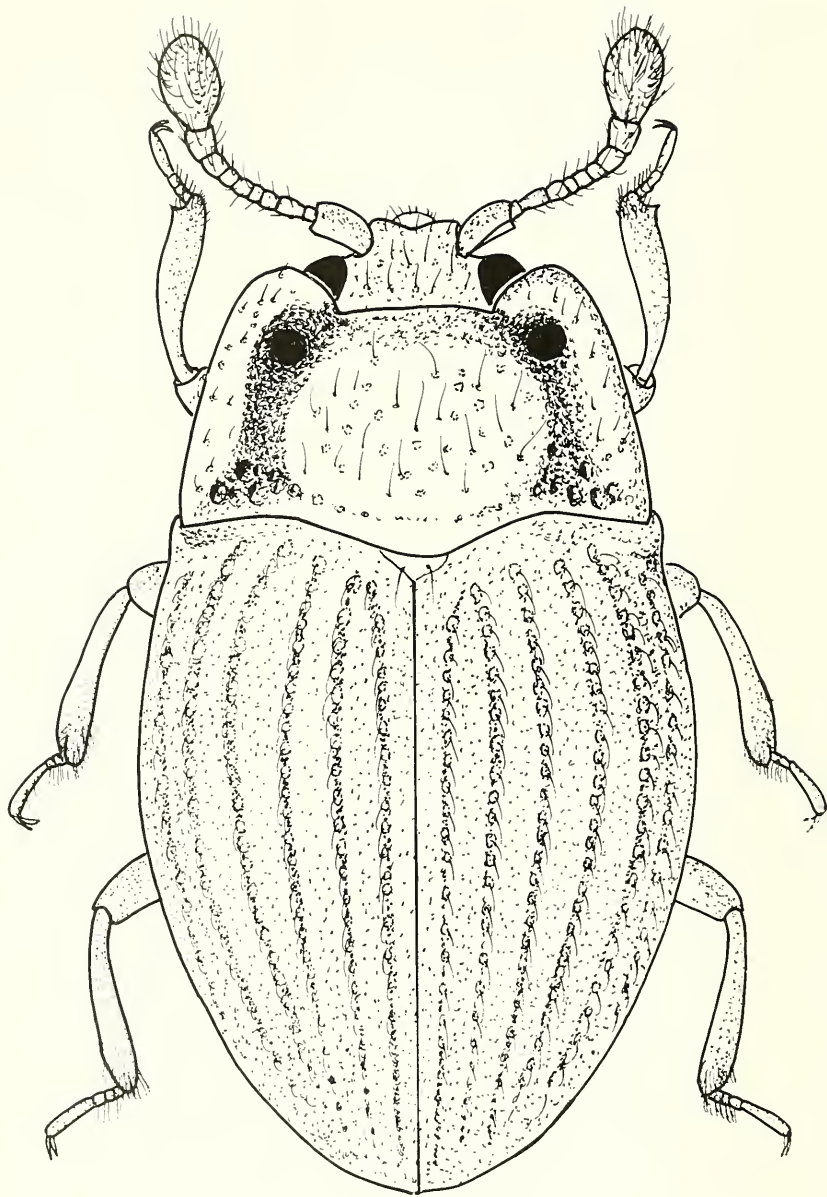


Fig. 48. *Paracerylon biroi* (Heinze).

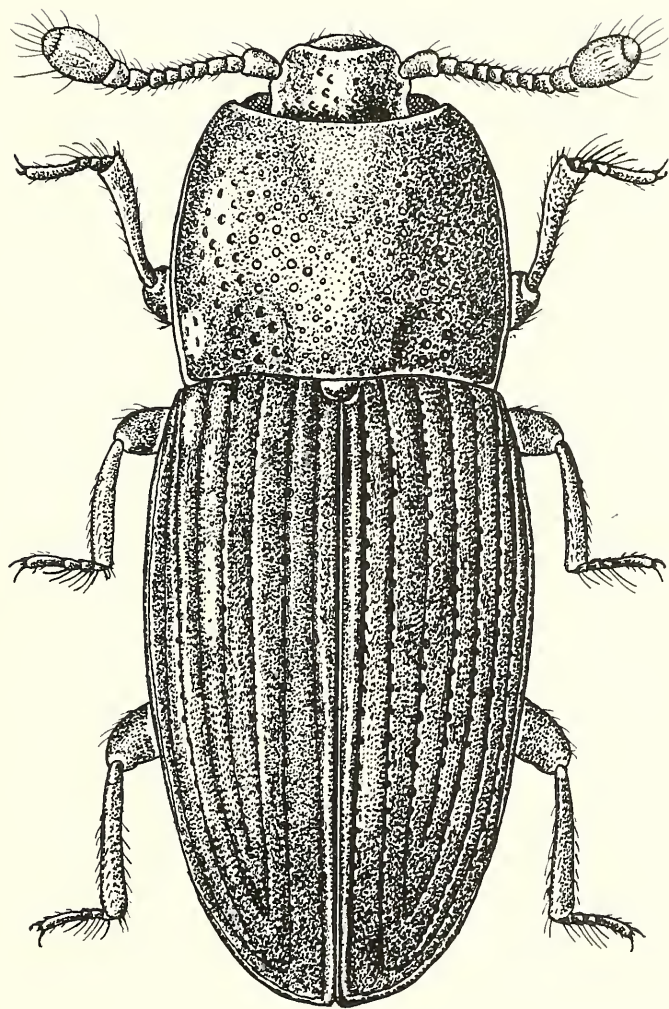


Fig. 49. *Cerylon fagi* (Guérin), by B. Burakowski.

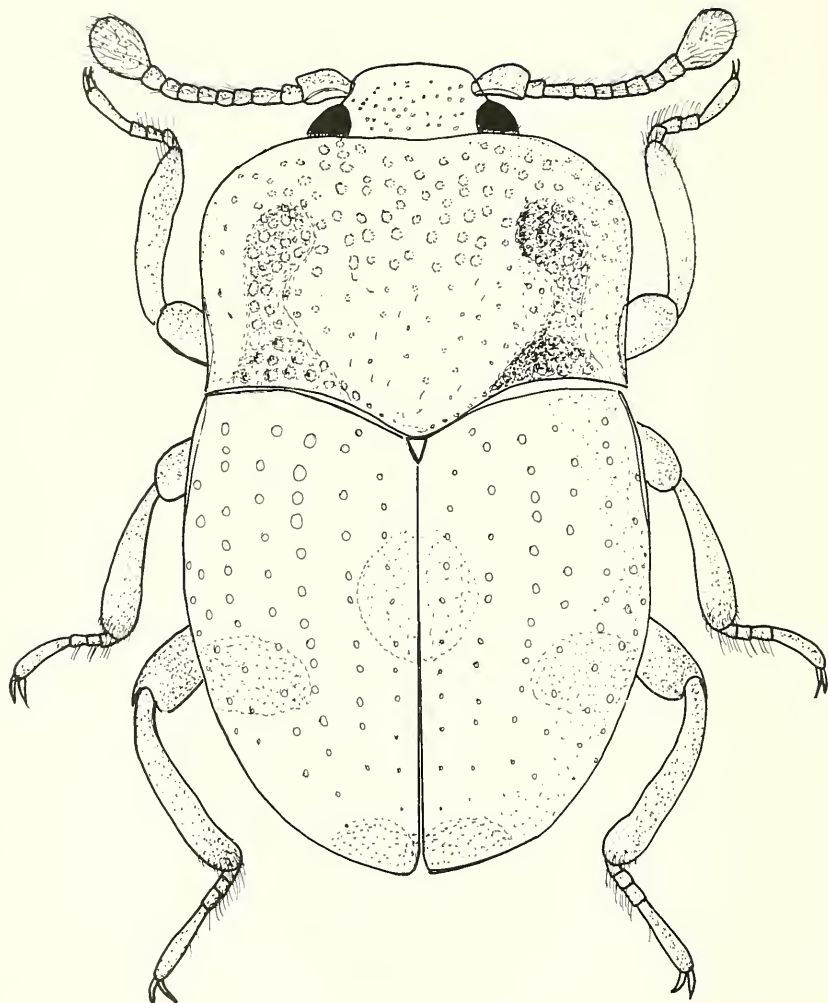


Fig. 50. *Pseudocerylon* sp. n. (Sumatra).

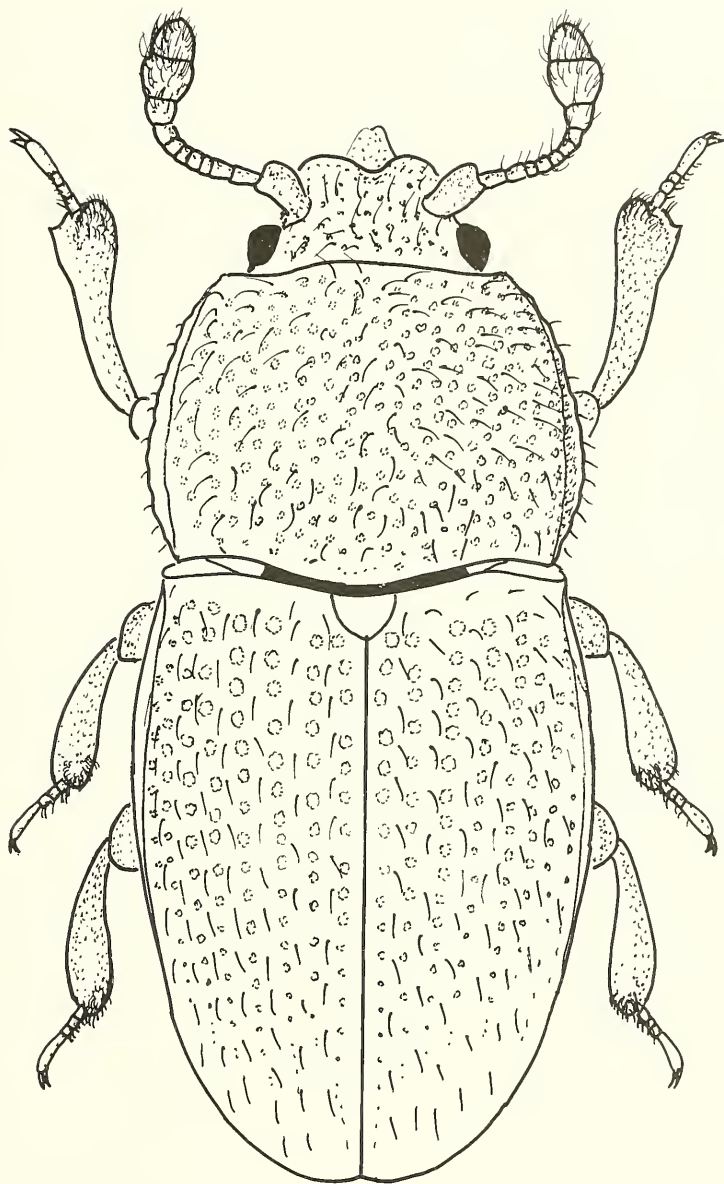


Fig. 51. *Orientrylon fallax* (Hinton).

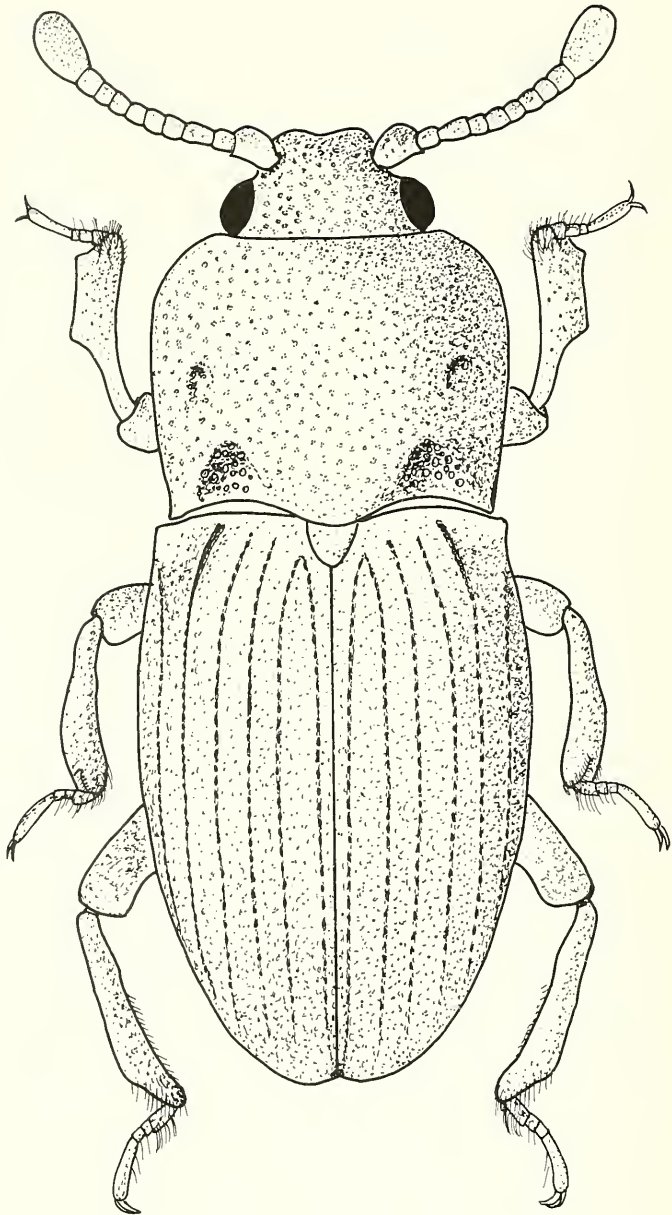


Fig. 52. *Afriorylon substriatus* (Grouvelle).

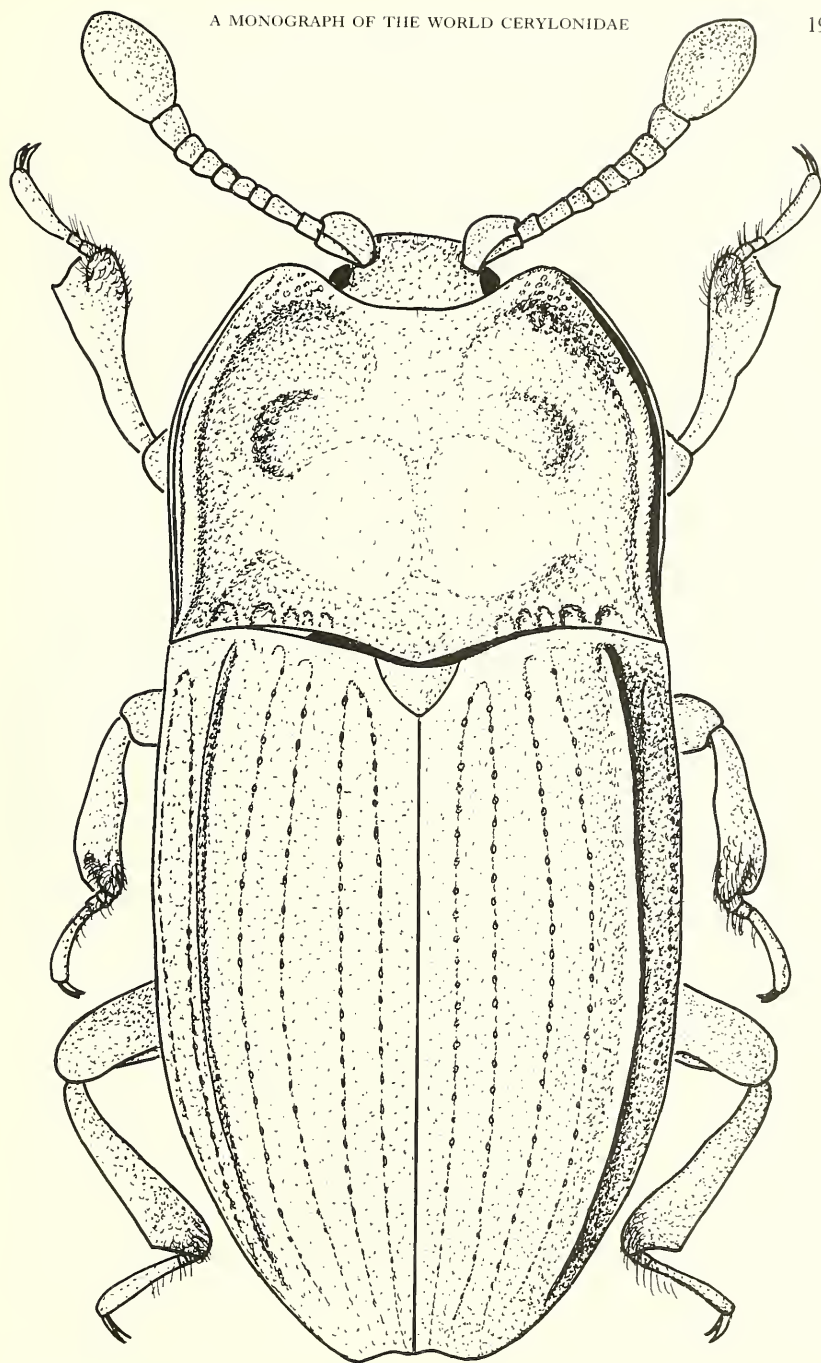


Fig. 53. *Suakokoia striata* (Sen Gupta and Crowson).



Fig. 54. *Ivius costatus* sp. n., by R. Dzwonkowski.

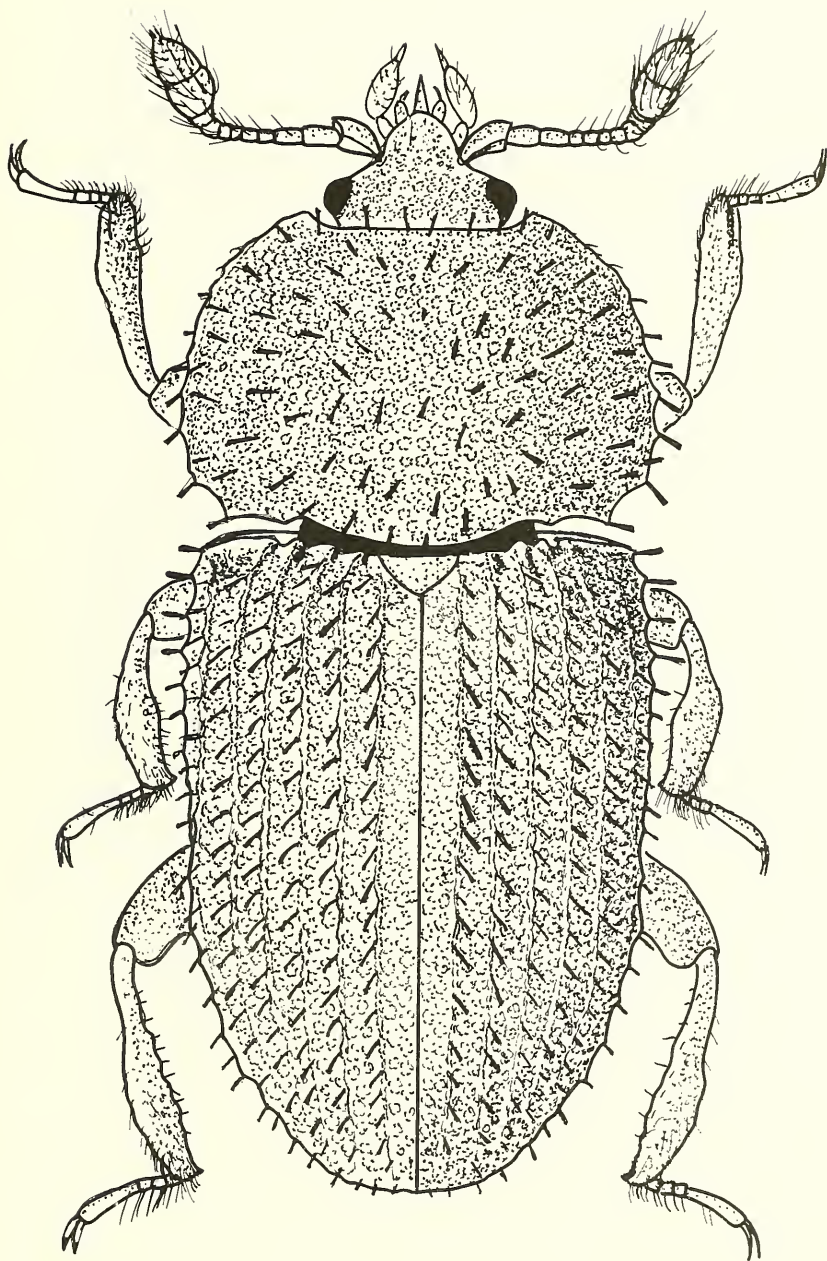


Fig. 55. *Cautomus hystriculus* Sharp.

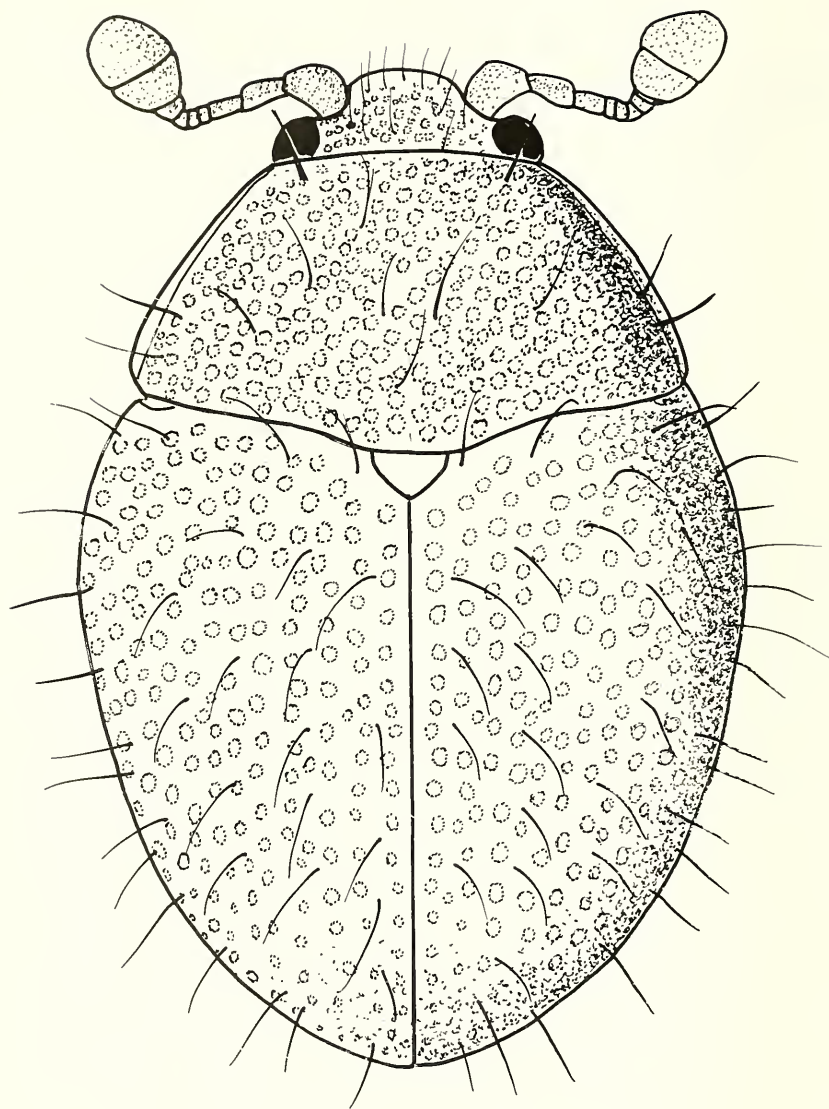


Fig. 56. *Glomerylon gemma* sp. n.

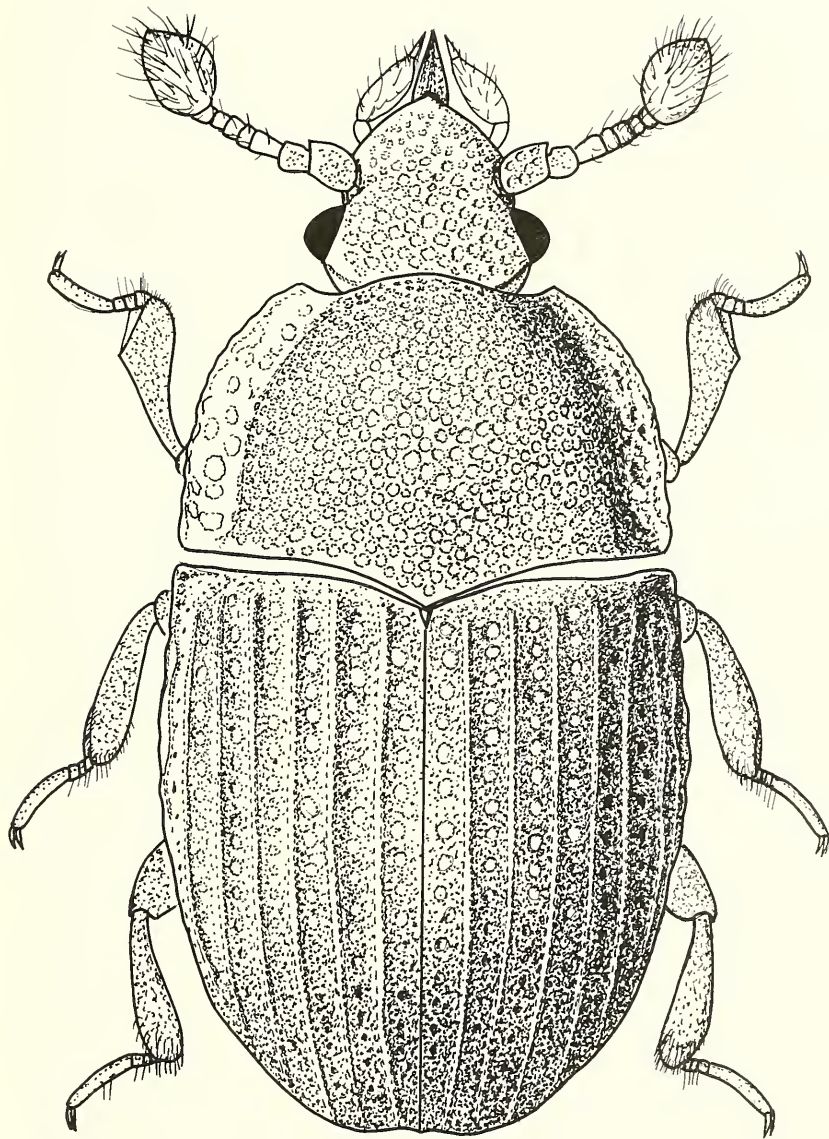


Fig. 57. *Pseudolapethus* sp. n. (Peru).

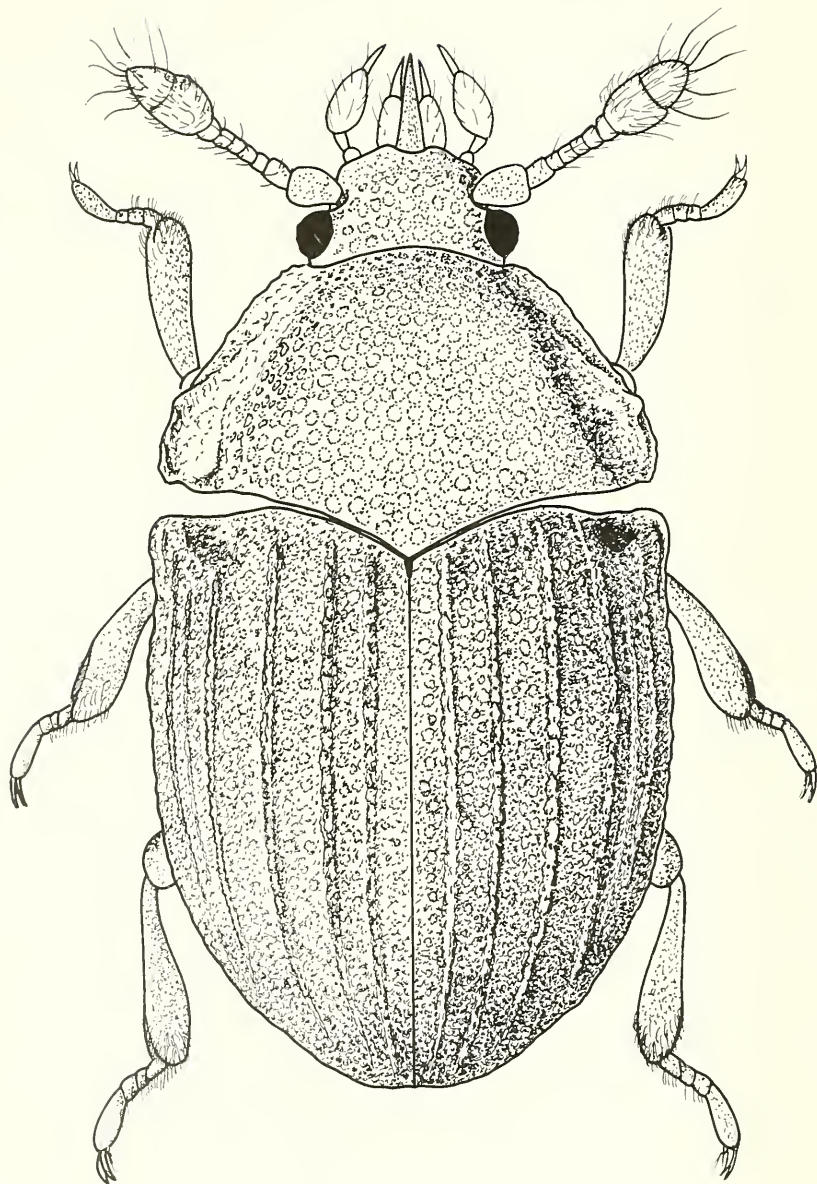


Fig. 58. *Rostrorylon vaucheri* sp. n.

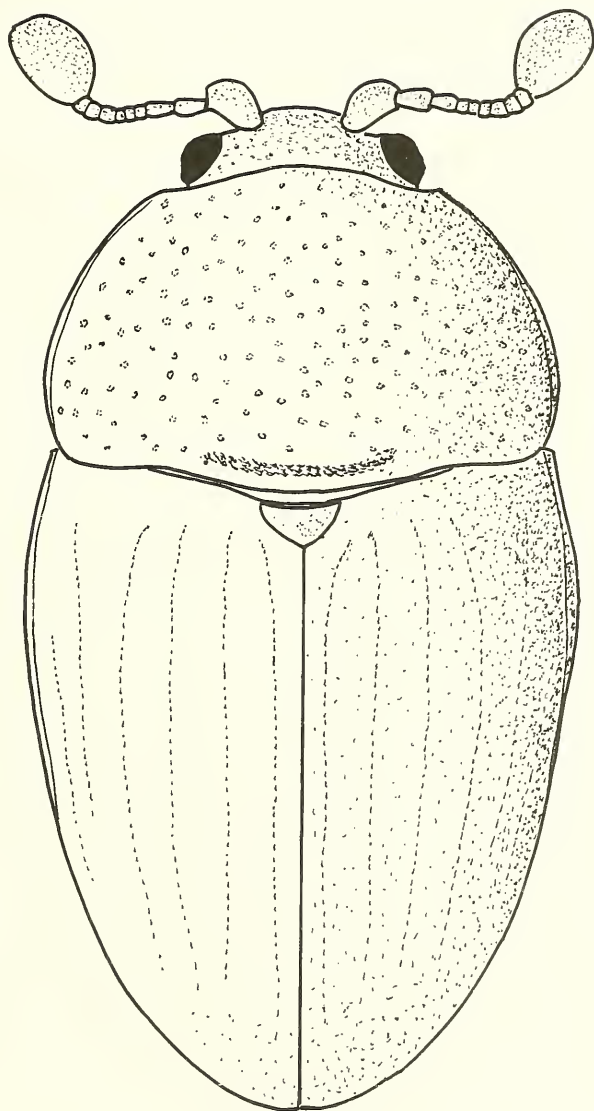


Fig. 59. *Lapethinus* sp. n. (Peru).

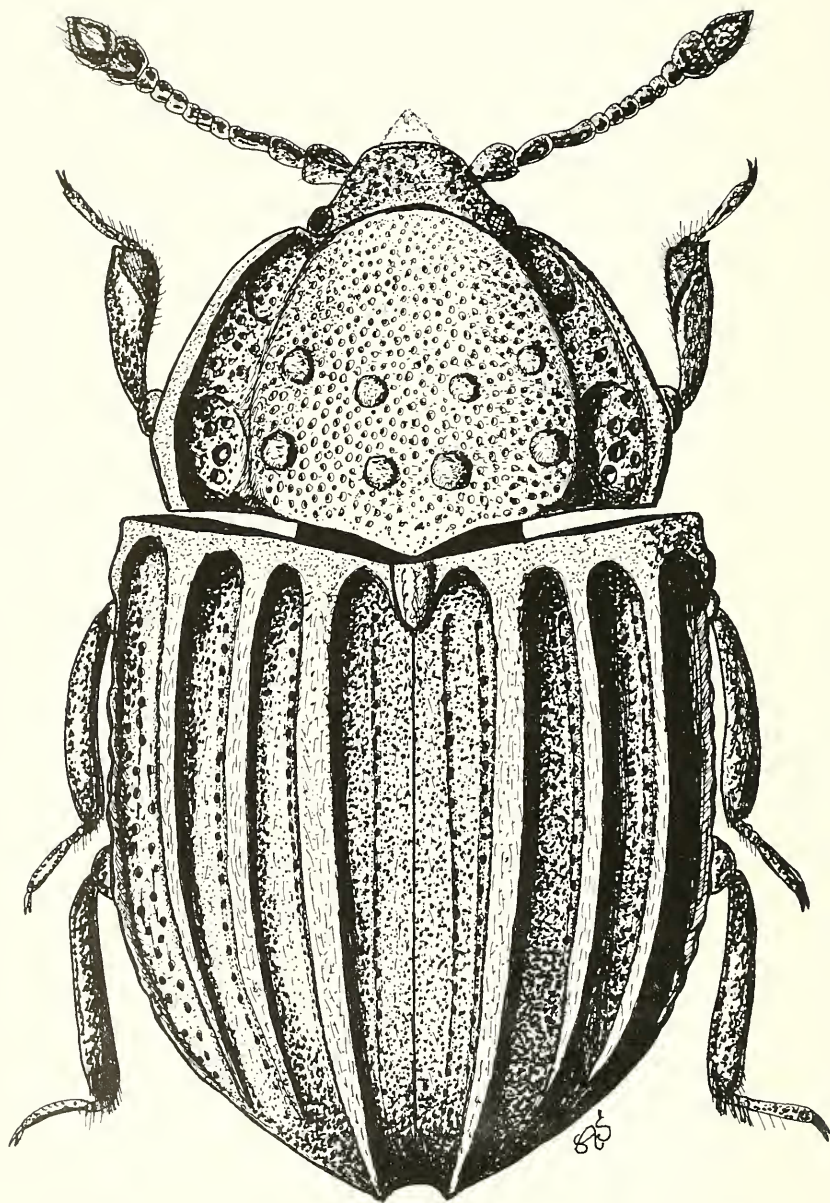


Fig. 60. *Lawrenciella costata* (Slipinski).

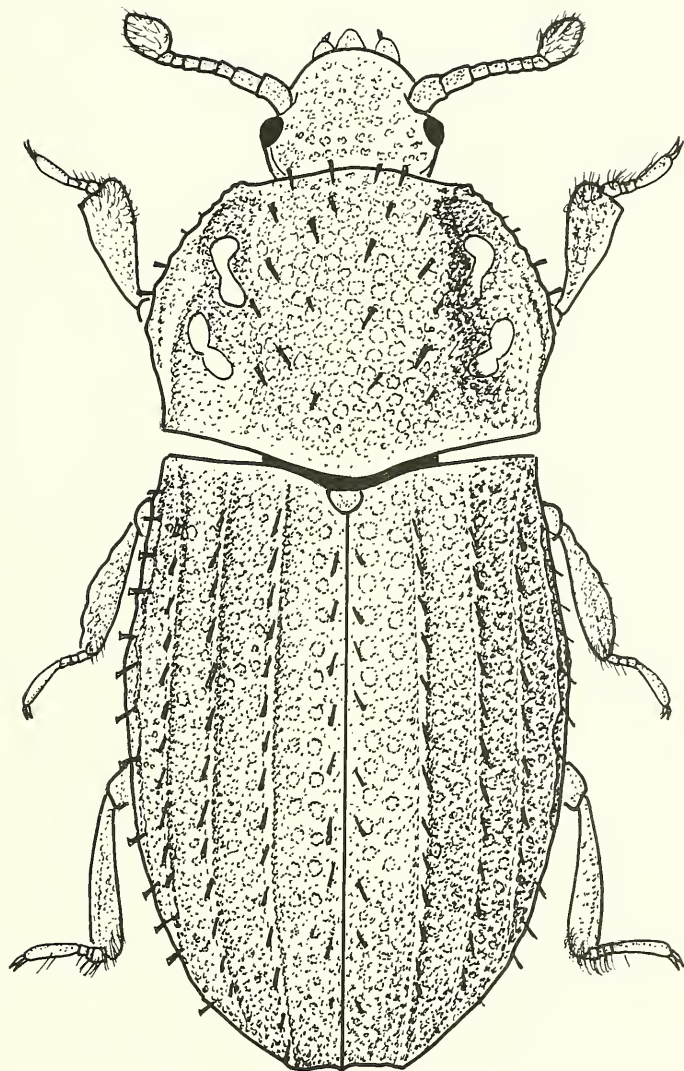


Fig. 61. *Thyroderus* sp. n. (Nepal).

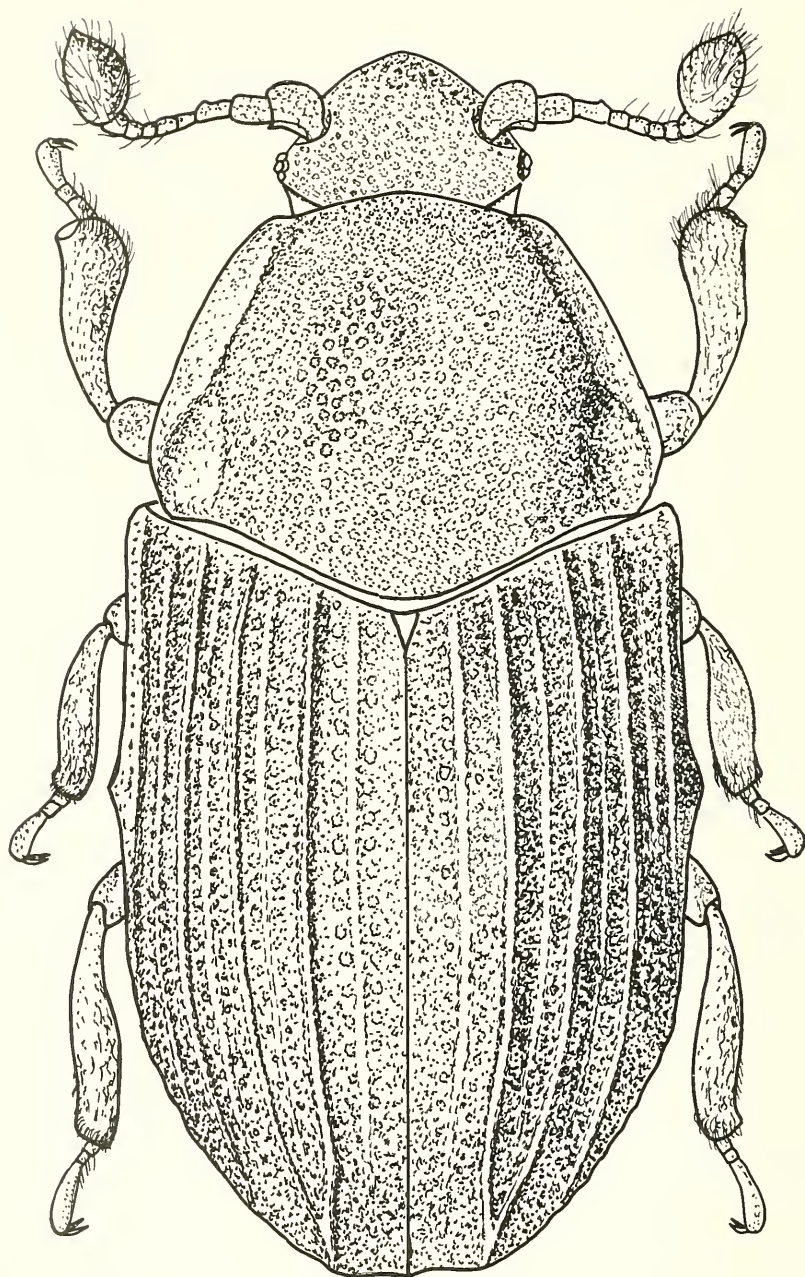


Fig. 62. *Angolon* sp. n. (Kenya).

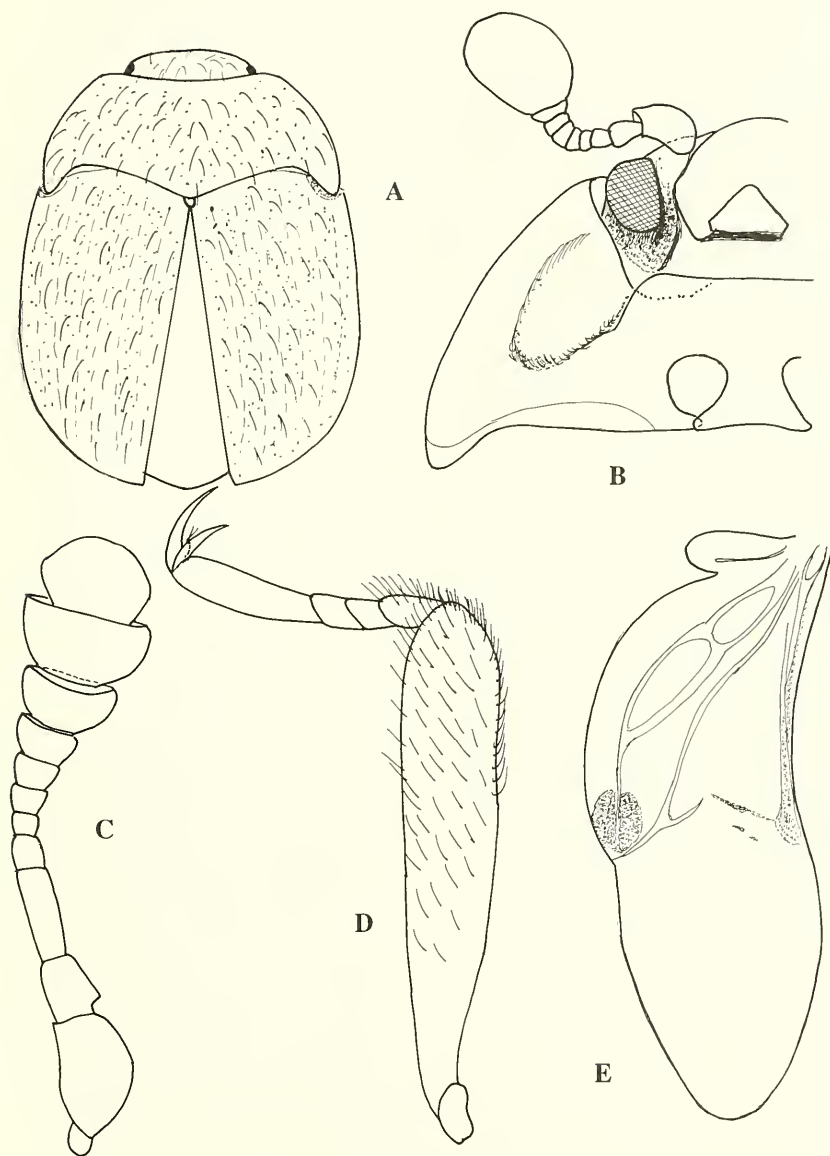


Fig. 63. a-b. *Bradycycloxeus lobicollis*: a - outline of holotype; b - head and prothorax, ventral; c-e. *Protoxestus australicus*: c - antenna; d - protibia and tarsus; e - wing.

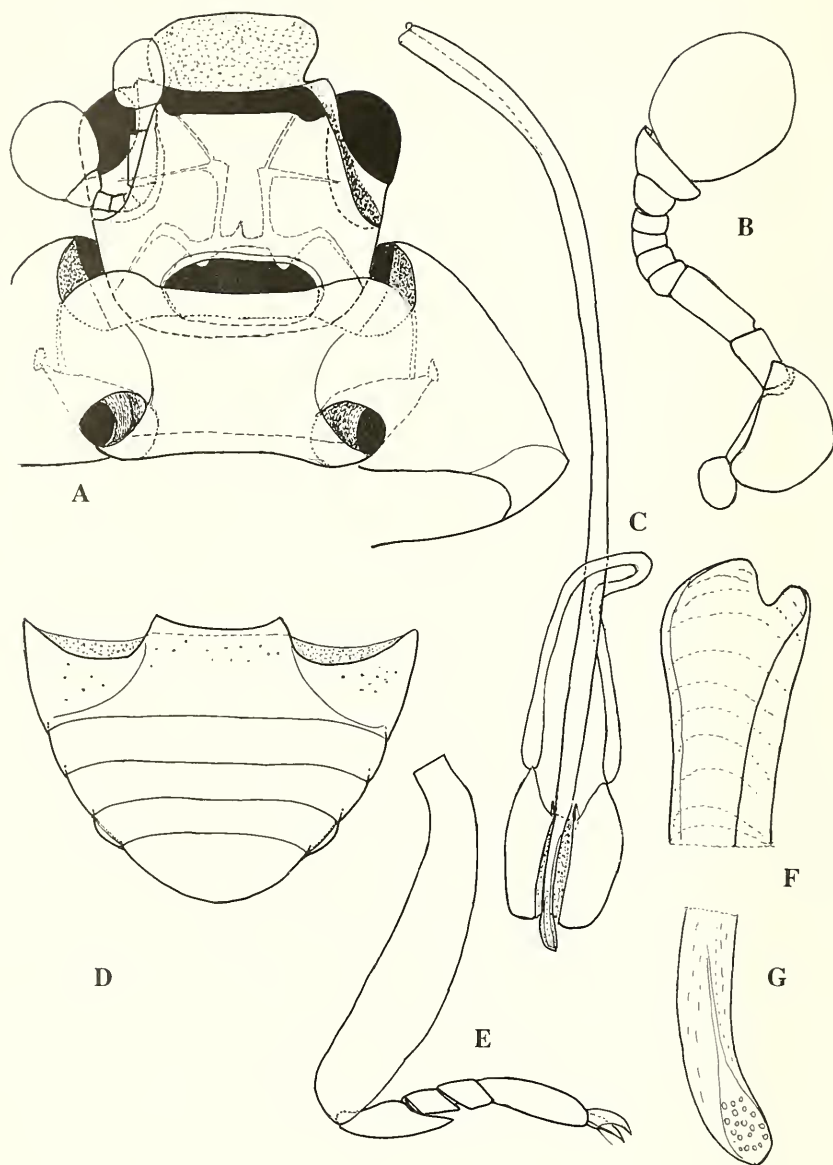


Fig. 64. *Hypodacnella euxestoides*: a - head and prothorax ventral; b - antenna; c - aedeagus, dorsal; d - abdomen, ventral; e - protibia and tarsus; f - median lobe, basal piece; g - median lobe, apical piece.

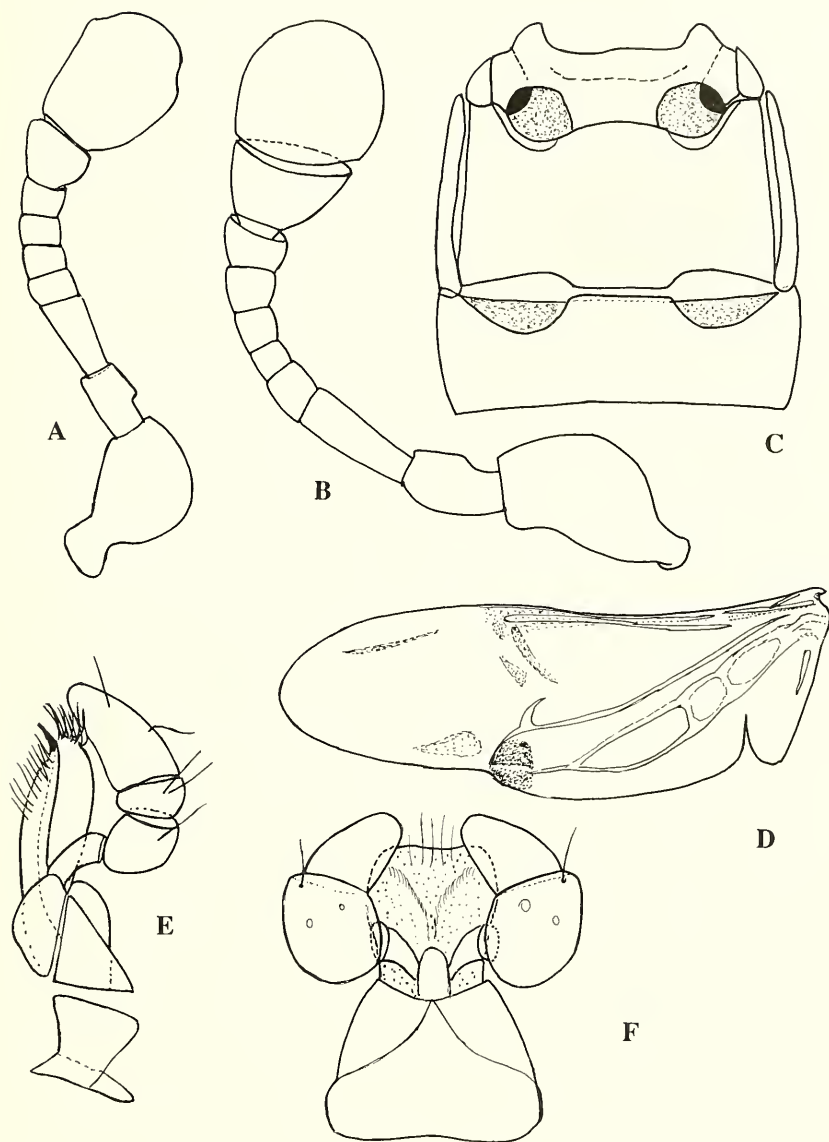


Fig. 65. *Hypodacne punctata*: a - antenna; c - prothorax and abdominal ventrite I, ventral; d - wing; e - maxilla, ventral; f - labium, ventral. - *H. edithae*: b - antenna.

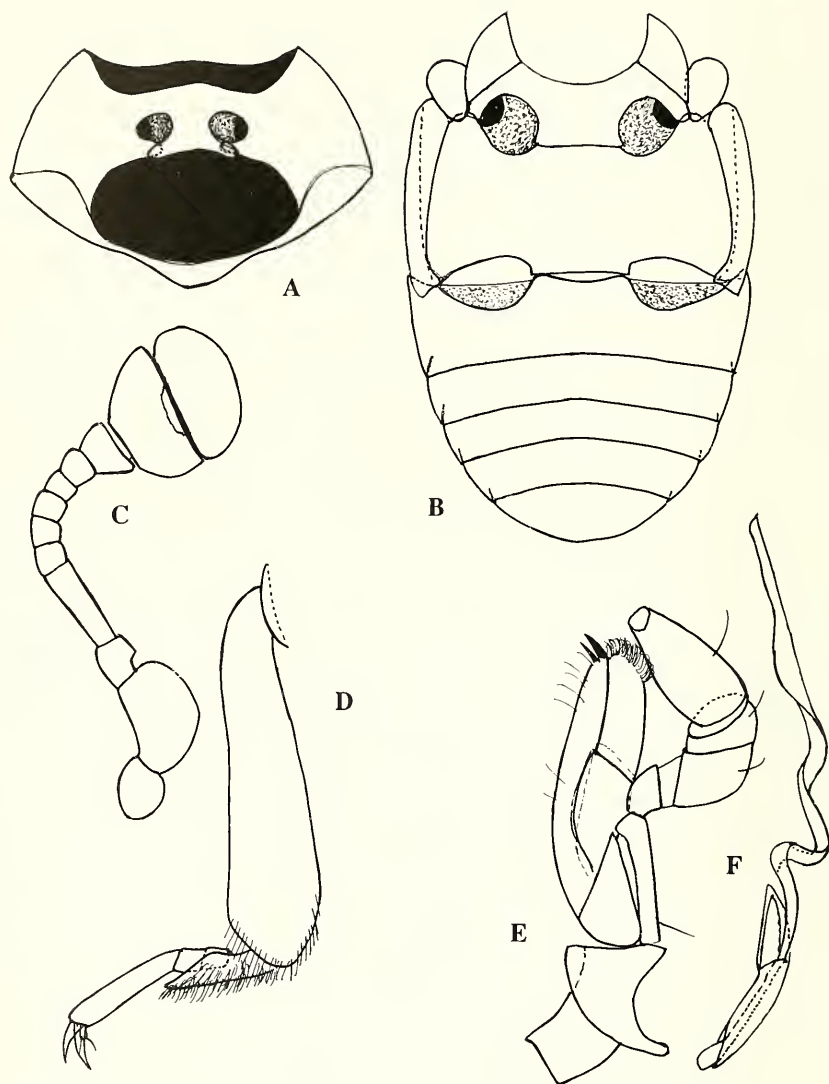


Fig. 66. *Pseudodacne admirabilis*: a - prothorax, ventral; b - pterothorax and abdomen, ventral; c - antenna; d - protibia and tarsus; e - maxilla, ventral. - *Metaxestus* sp.: f - aedeagus, ventral.

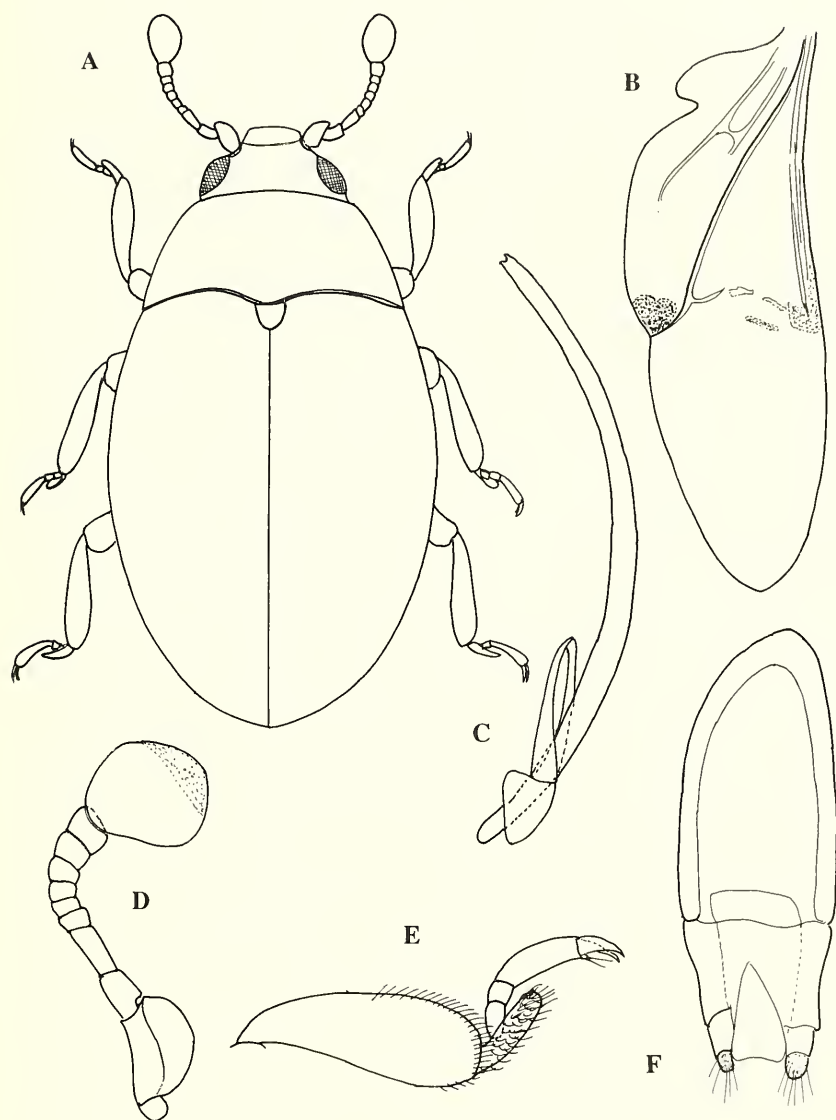


Fig. 67. *Euxestus* sp.: a - body outline; b - wing; c - aedeagus, ventral; d - antenna; e - protibia and tarsus; f - tegmen, dorsal.

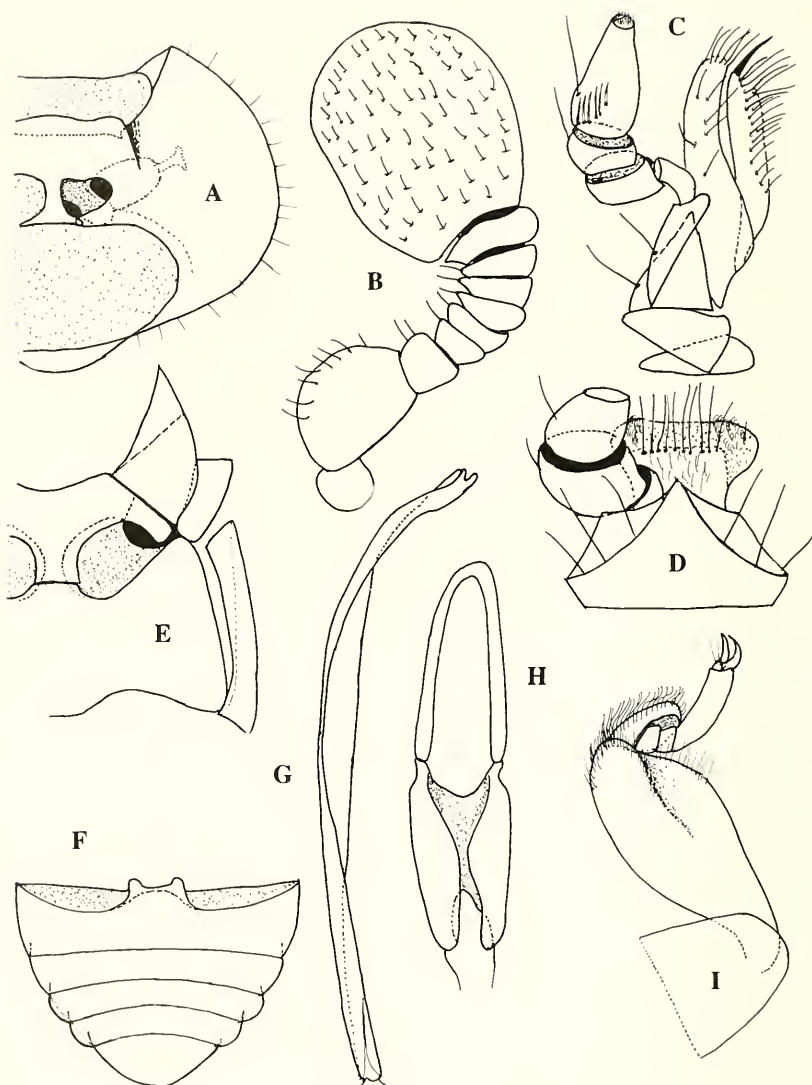


Fig. 68. *Cycloxenus hispidus*: a - prothorax, ventral; b - antenna; c - maxilla, ventral; d - labium, ventral; e - pterothorax, ventral; f - abdomen, ventral; g - median lobe, dorsal; h - tegmen, dorsal; i - protibia and tarsus.

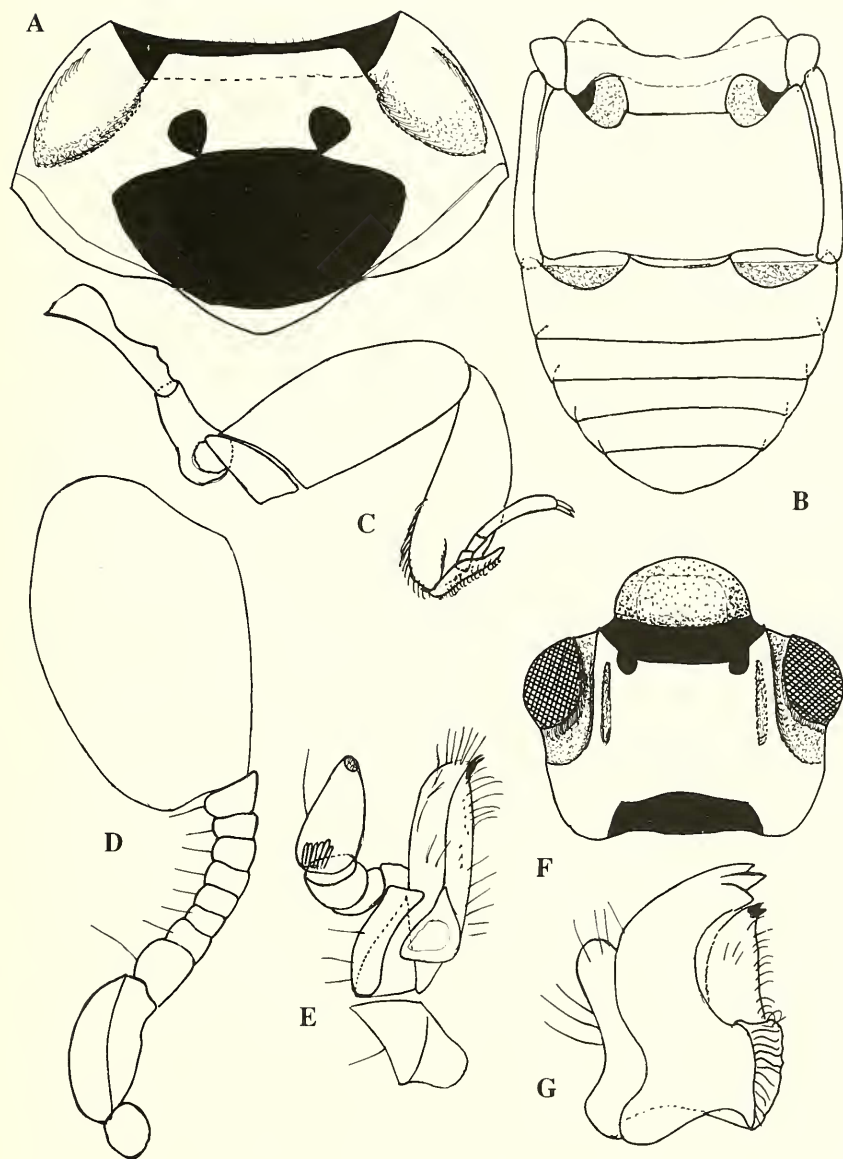


Fig. 69. *Euxestoxenus* sp.: a - prothorax, ventral; b - pterothorax and abdomen, ventral; c - prothoracic leg; d - antenna; e - maxilla, dorsal; f - head, ventral; g - mandible.

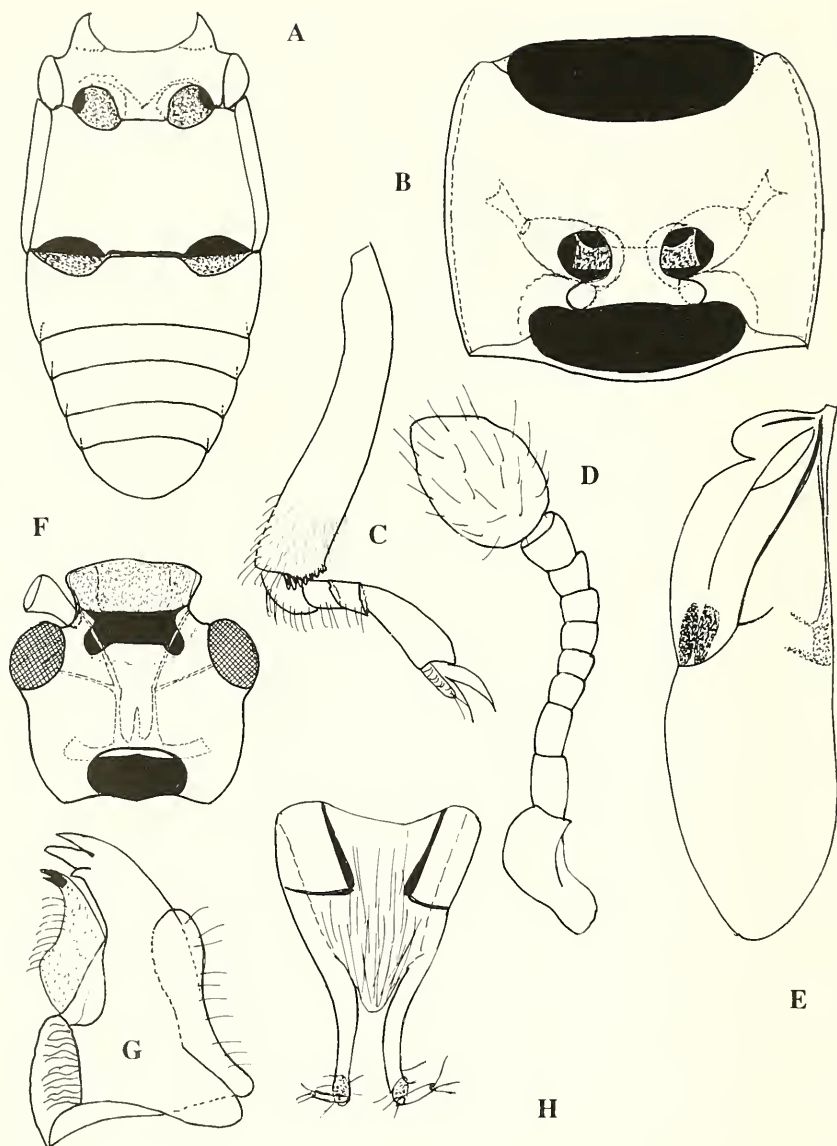


Fig. 70. *Metaxestus* sp.: a - pterothorax and abdomen, ventral; b - prothorax, ventral; c - protibia and tarsus; d - antenna; e - wing; f - head, ventral; g - mandible; h - ovipositor.

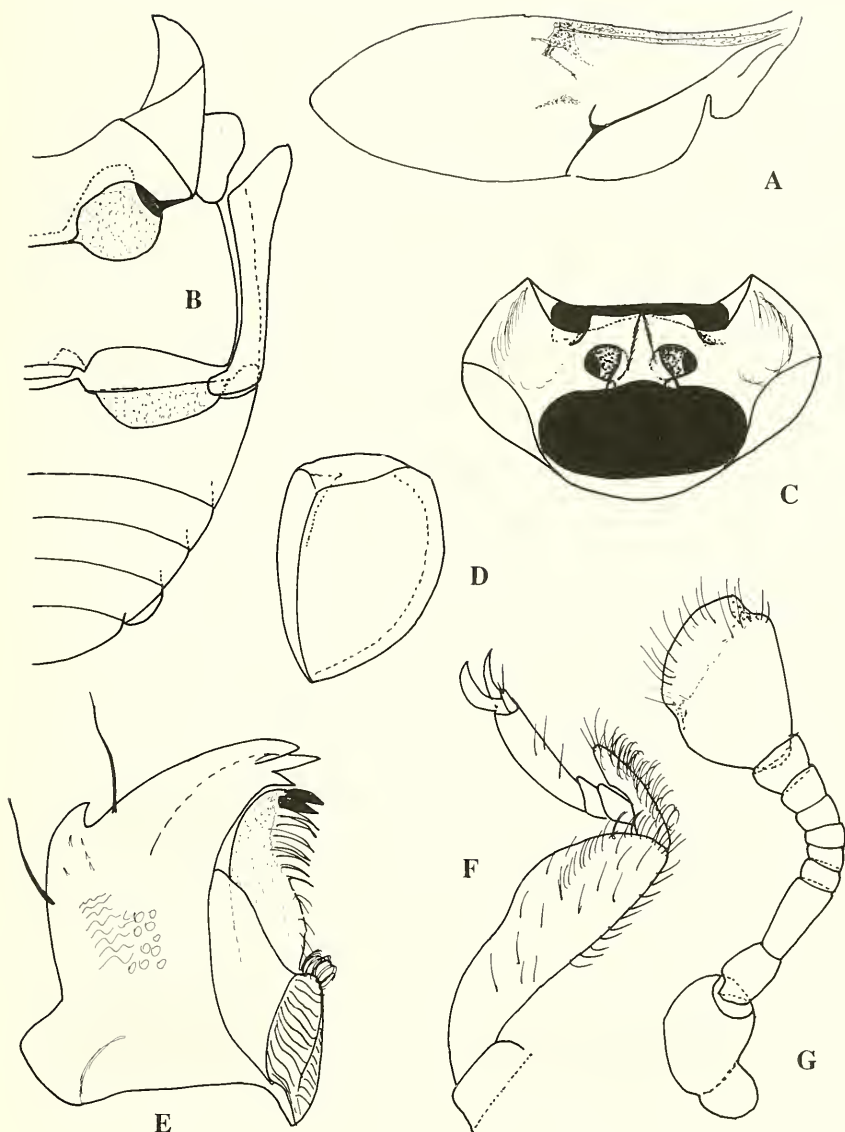


Fig. 71. *Globoeuxestus* sp.: a - wing; b - pterothorax and abdomen, ventral; c - prothorax, ventral; d - elytron, ventral; e - mandible; f - protibia and tarsus; g - antenna.

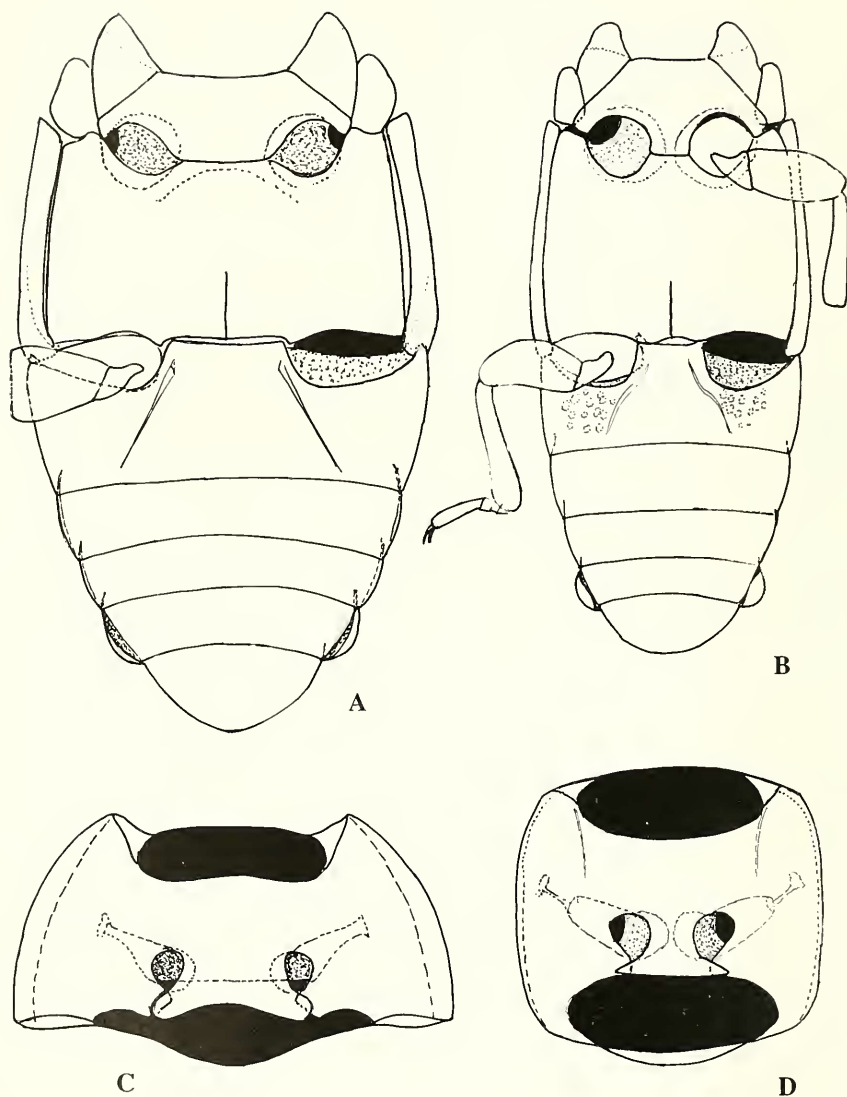


Fig. 72. *Metacerylon omercooperi*: a, c - *M. neotropicalis*: b, d. a-b - pterothorax and abdomen, ventral; c-d - prothorax, ventral.

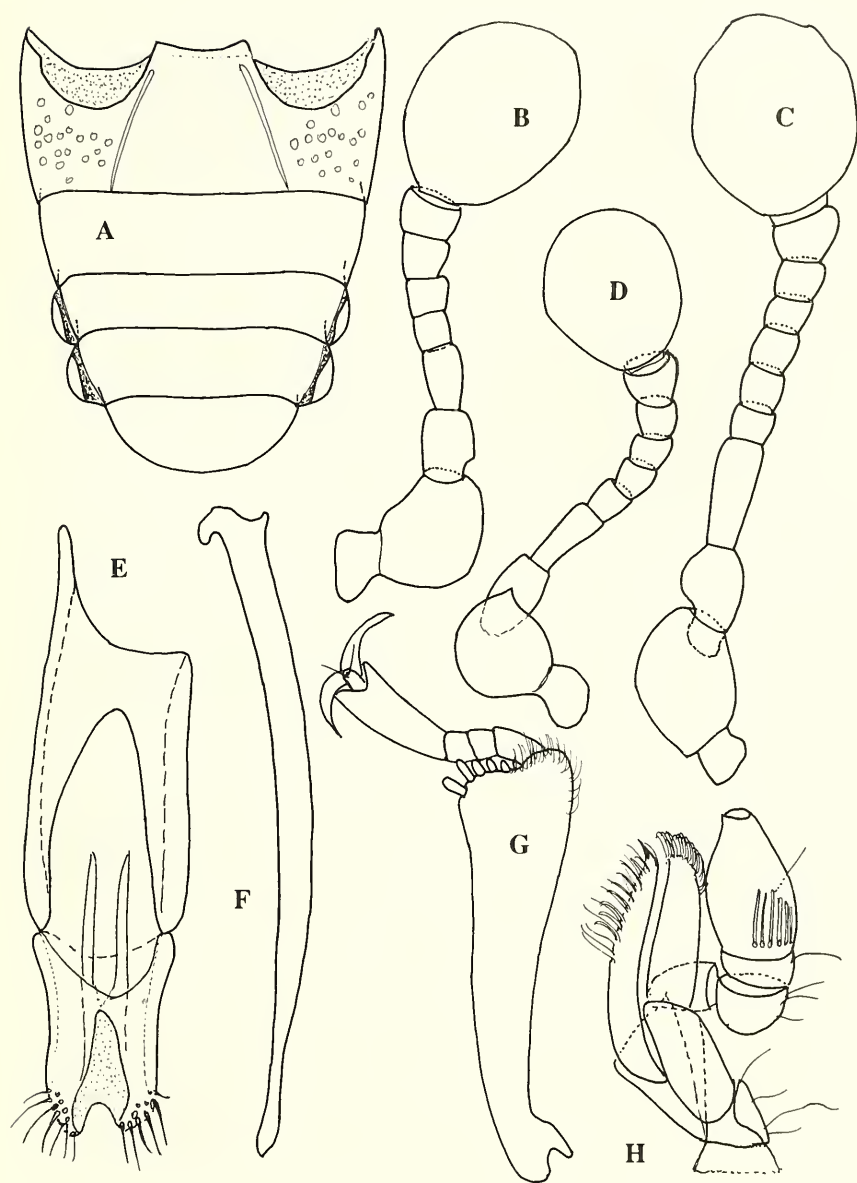


Fig. 73. *Metacerylon* sp.: a - abdomen, ventral; b-d - antenna; e - tegmen, dorsal; f - median lobe, ventral; g - protibia and tarsus; h - maxilla, dorsal. a, c - *M. minutus*; b - *M. neotropicalis*; d-h - *M. omercooperi*.

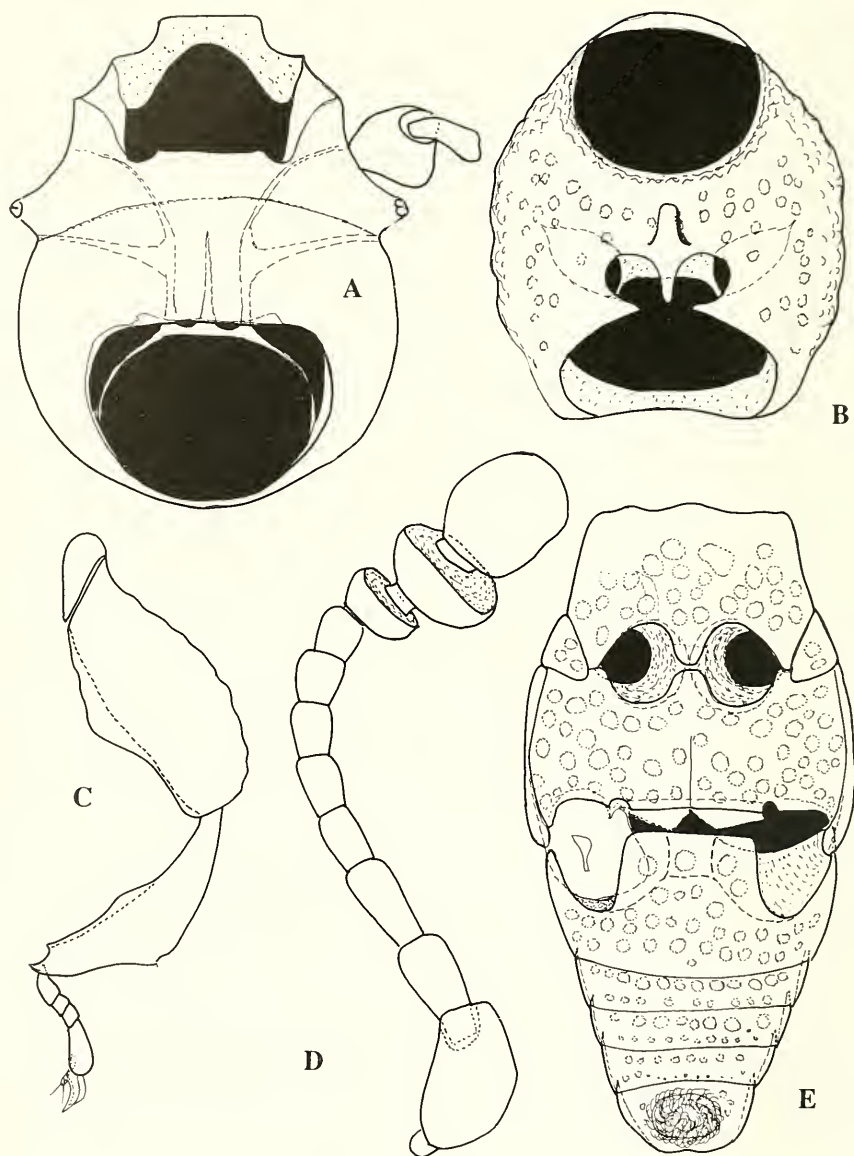


Fig. 74. *Loebliorylon* sp. male: a - head, ventral; b - prothorax, ventral; c - prothoracic leg, excluding coxa; d - antenna; e - pterothorax and abdomen, ventral.

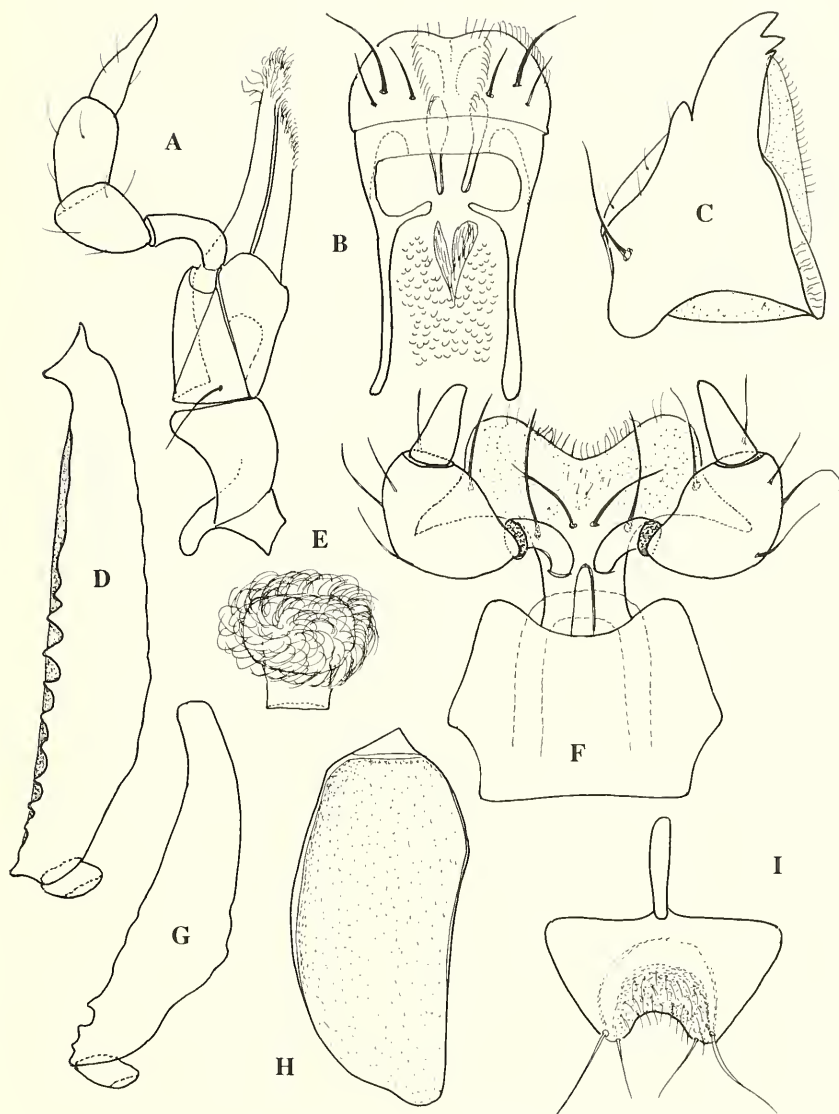


Fig. 75. *Loebliorylon* sp., male: a - maxilla, ventral; b - labrum, dorsal; c - mandible; d - posterior tibia; e - a hairy tubercle on male last ventrite, oblique view; f - labium, ventral; g - mesotibia; h - elytron, ventral; i - male VIII sternite.

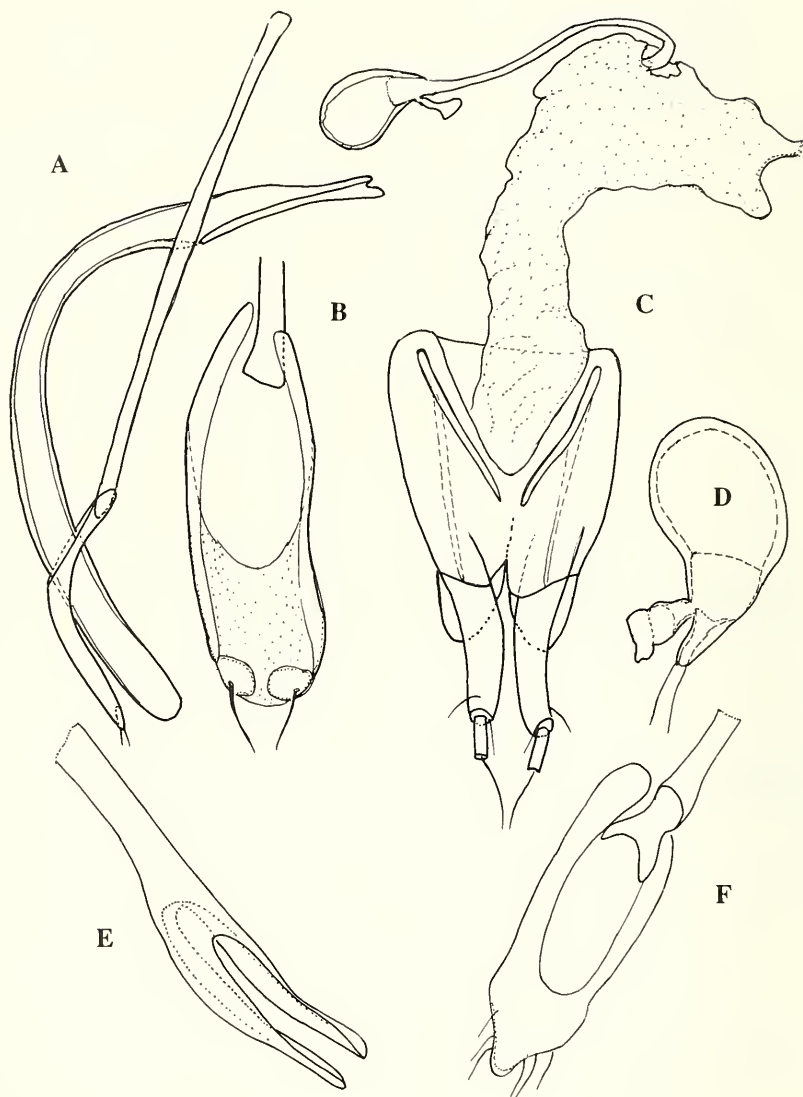


Fig. 76. *Loebliorylon* sp.: a - aedeagus, dorsal; b - tegmen, internal view; c - female genitalia; d - spermatheca. *L. carinatus*: E-F. e - median lobe, apical piece; f - tegmen, internal view.

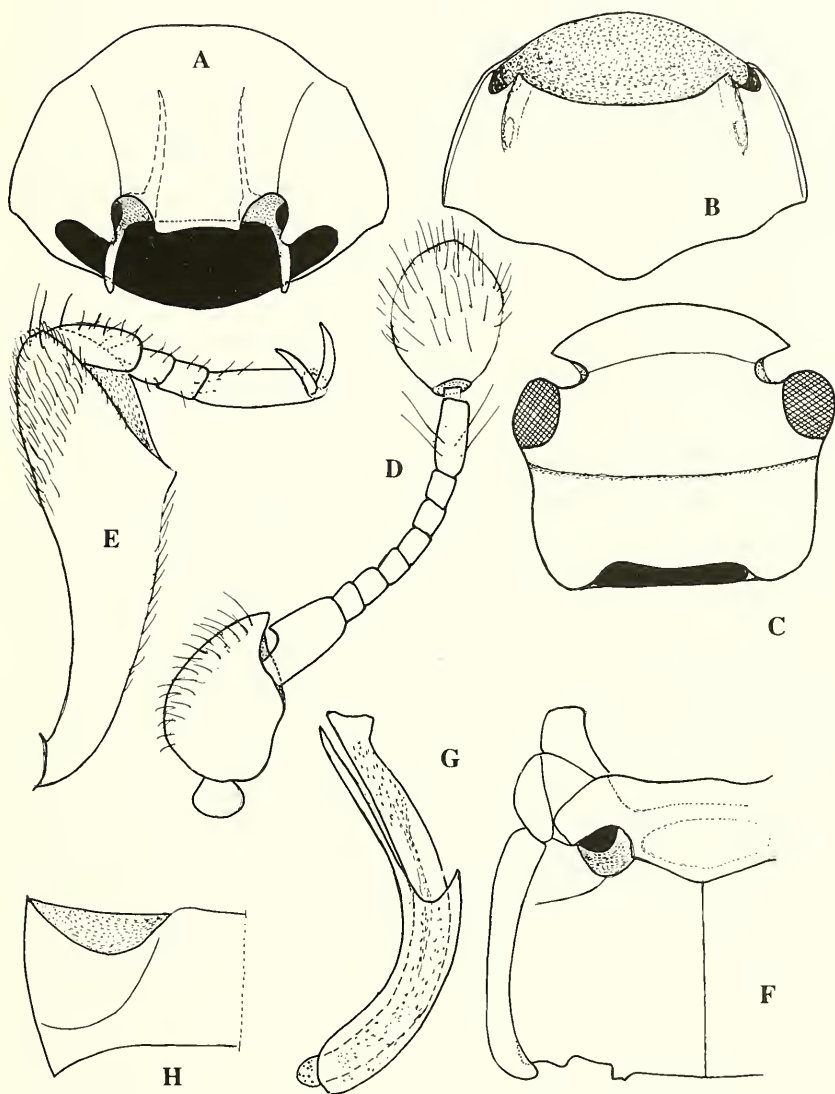


Fig. 77. *Murmidius ovalis*: a - prothorax, ventral; b - prothorax, dorsal; c - head, dorsal; d - antenna; e - protibia and tarsus; f - pterothorax, ventral; g - aedeagus, ventral; h - abdominal ventrite I, ventral.

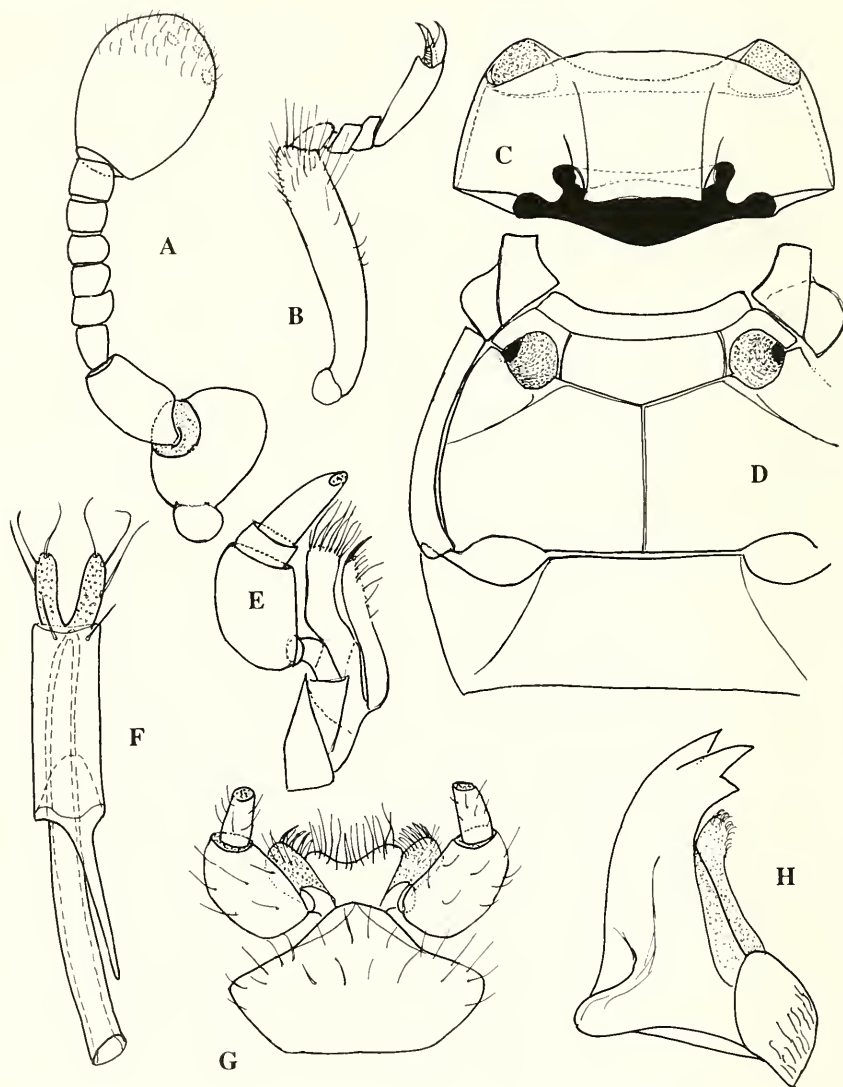


Fig. 78. *Myhocerinus* sp.: a - antenna; b - protibia and tarsus; c - prothorax, ventral; d - pterothorax and abdominal ventrite I, ventral; e - maxilla, dorsal; f - aedeagus, dorsal; g - labium, ventral; h - mandible.

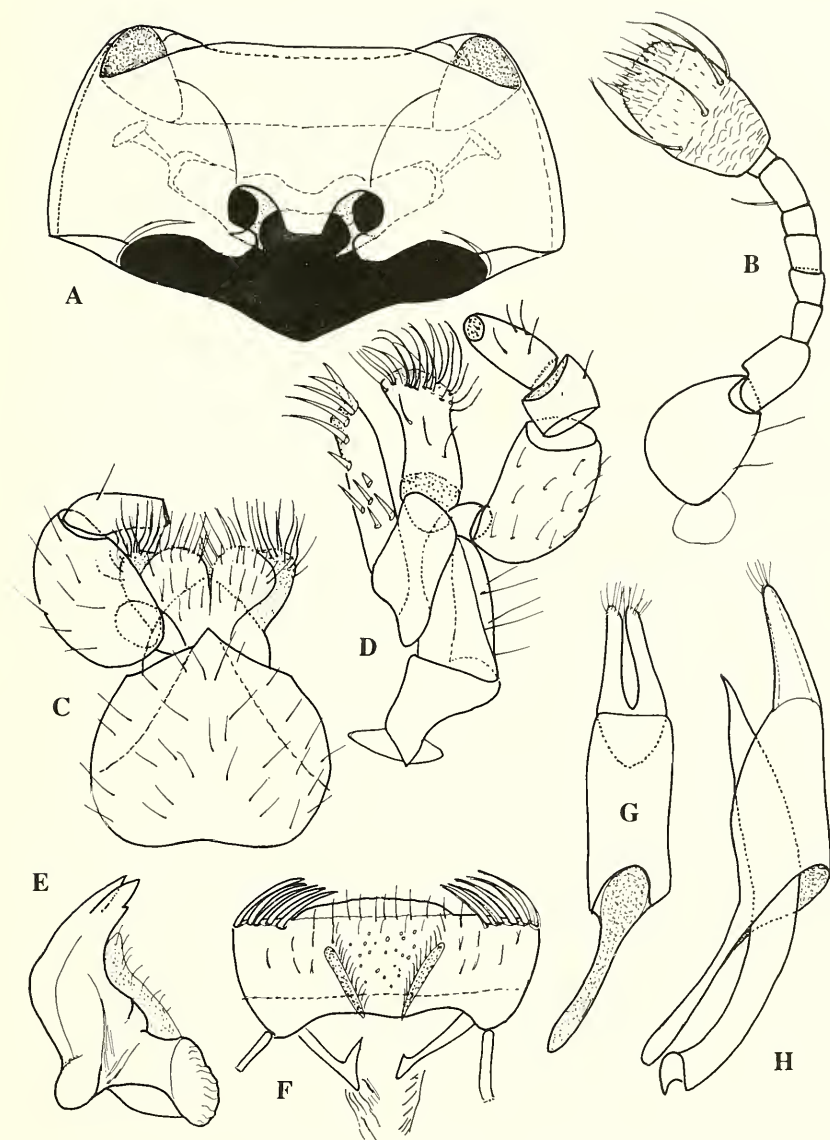


Fig. 79. *Botrodus dufaui*: a - prothorax, ventral; b - antenna; c - labium, ventral; d - maxilla, ventral; e - mandible; f - labrum-epipharynx; g - tegmen, side view; h - aedeagus, ventral.

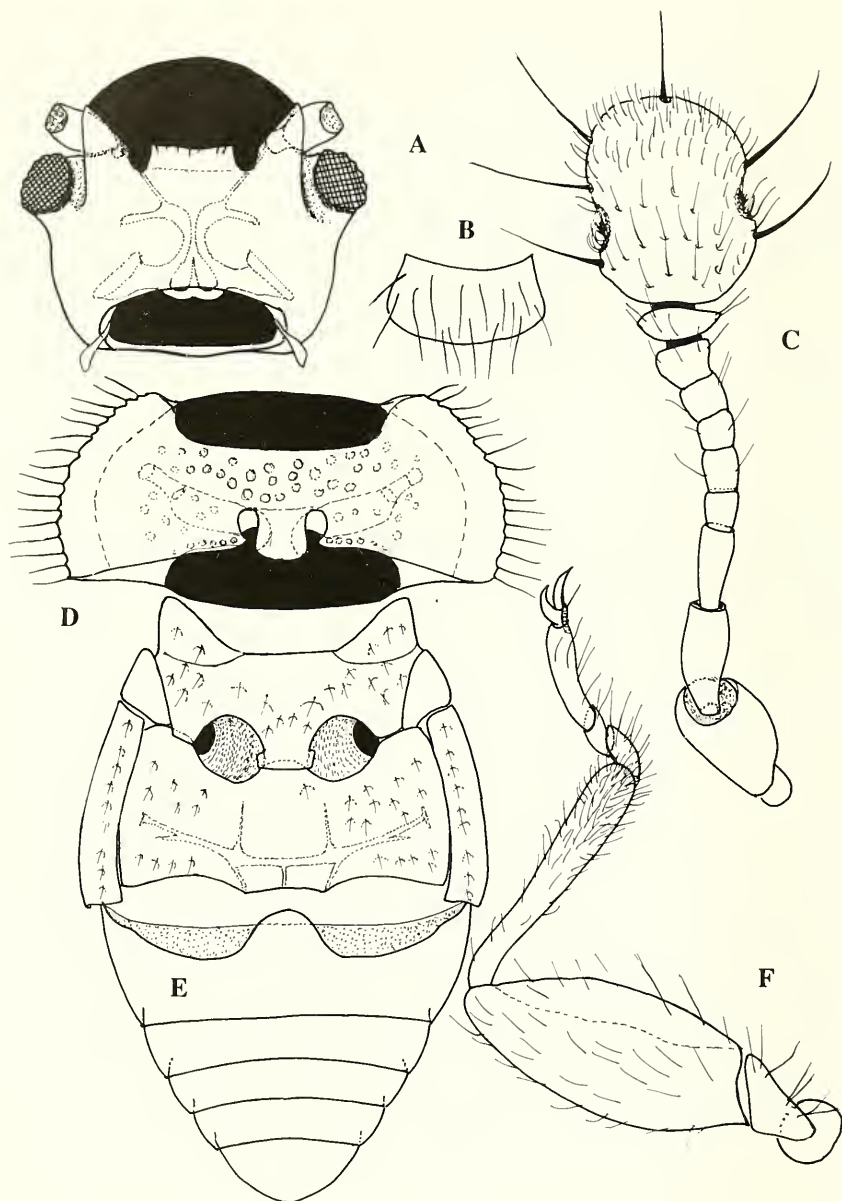


Fig. 80. *Ostomopsis* sp.: a - head ventral; b - scutellum; c - antenna; d - prothorax, ventral; e - pterothorax and abdomen, ventral; f - prothoracic leg.

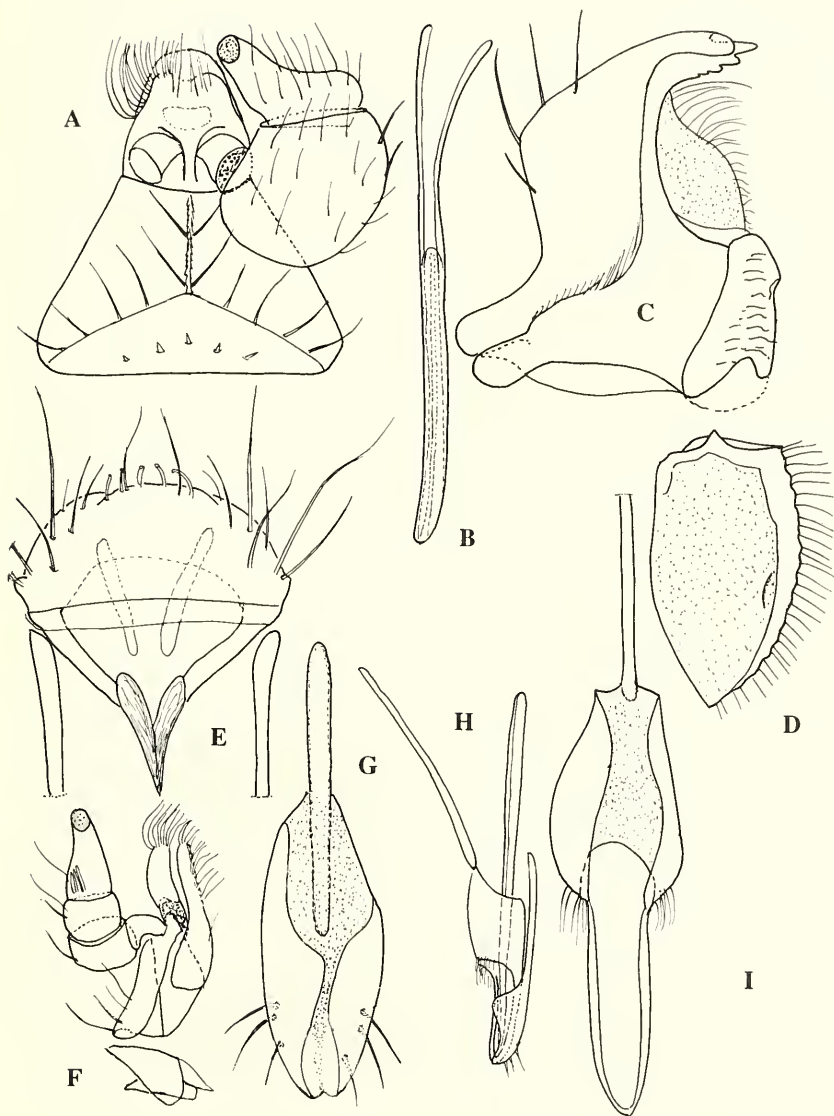


Fig. 81. *Ostomopsis* sp.: a - labium, ventral; b - median lobe; c - mandible; d - elytron, ventral; e - labrum-epipharynx, dorsal; f - maxilla, dorsal; g - male VIII sternite; h - aedeagus and VIII sternite, ventral; i - tegmen, inner view.

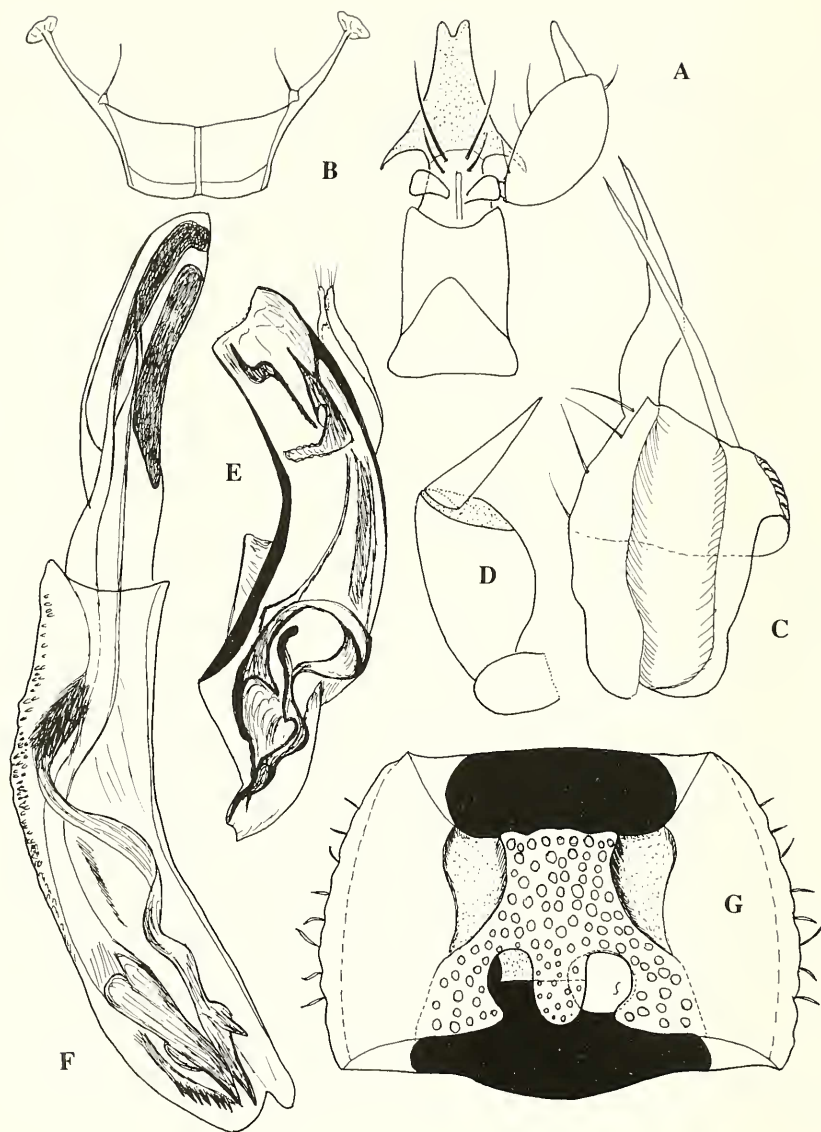


Fig. 82. *Philothermus* spp.: a - labium, ventral; b - metendosternite, dorsal; c - mandible; d - maxillary palps; e - median lobe, dorsal; f - aedeagus, ventral; g - prothorax, ventral. a-d, f, g - *P. floridensis*; e - *P. sp. n.* from Peru (with extremely elongate mouthparts).

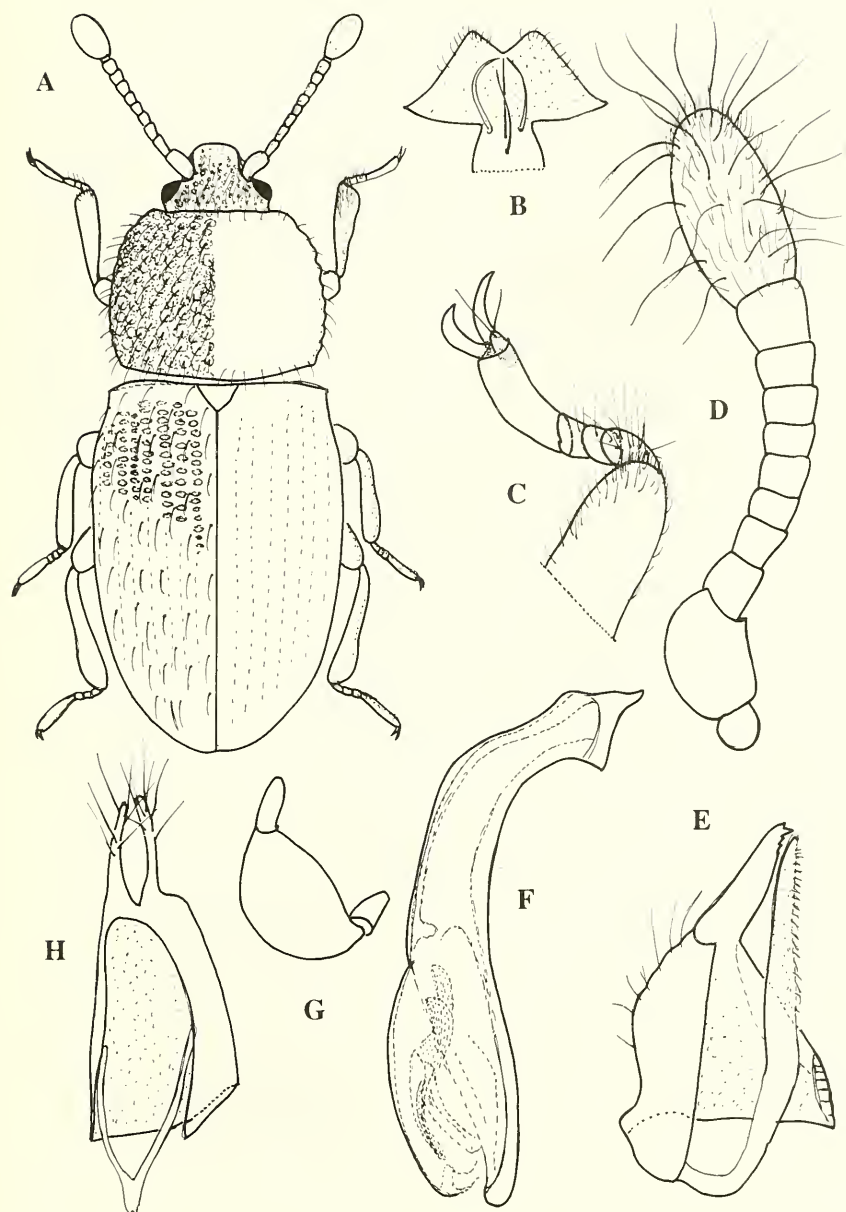


Fig. 83. *Ectomicrus* spp.: a - outline of *E. setosus*; b - prementum and ligula, dorsal; c - protibia and tarsus; d - antenna; e - mandible; f - median lobe, dorsal; g - labial palps; h - tegmen, ventral.

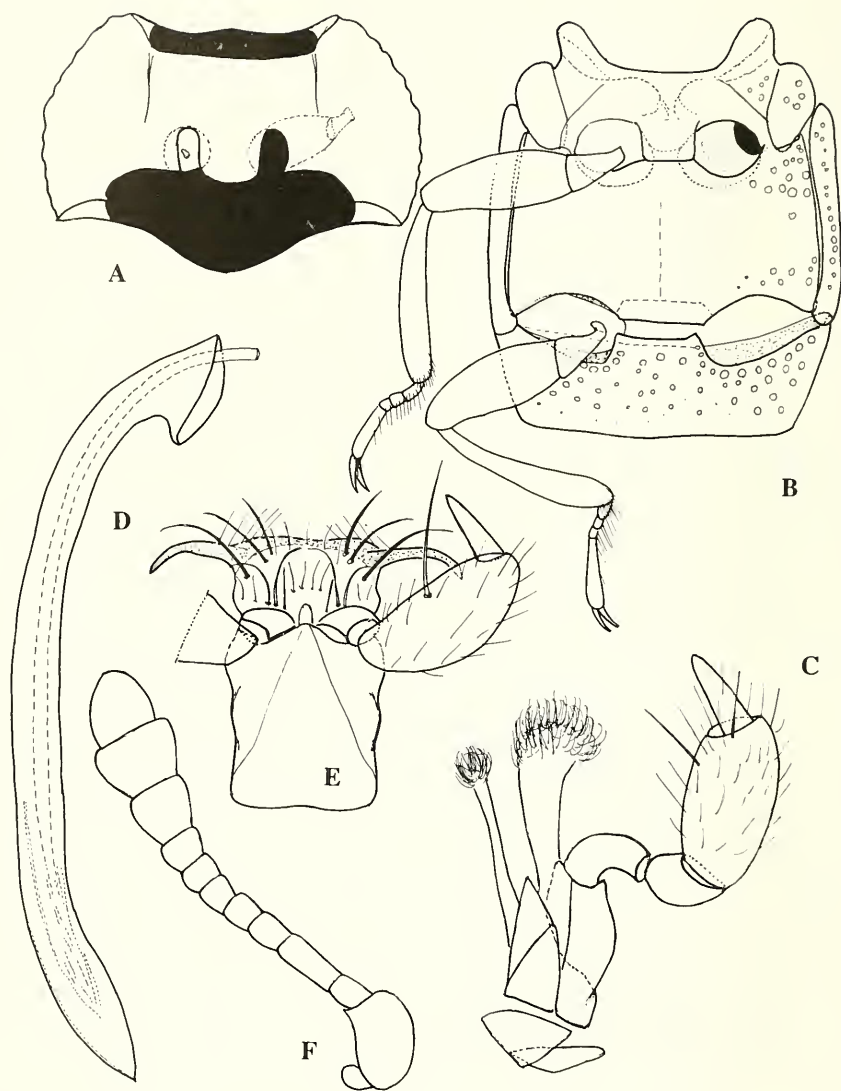


Fig. 84. *Pakalukia napa*: a - prothorax, ventral; b - pterothorax and ventrite I, ventral; c - maxilla, ventral; d - median lobe, dorsal; e - labium, ventral; f - antenna.

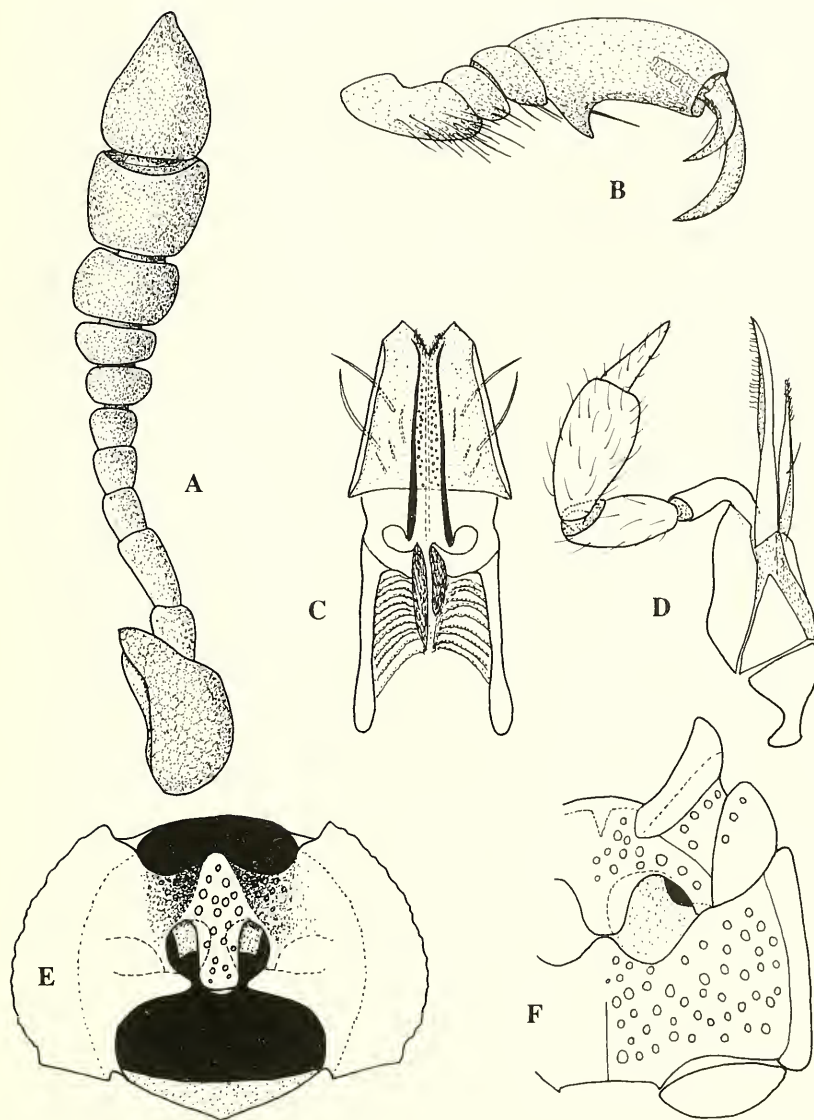


Fig. 85. *Glyptolopus* spp.: a - antenna; b - male protarsus; c - labrum-epipharynx, ventral; d - maxilla, ventral; e - prothorax, ventral; f - pterothorax, ventral.

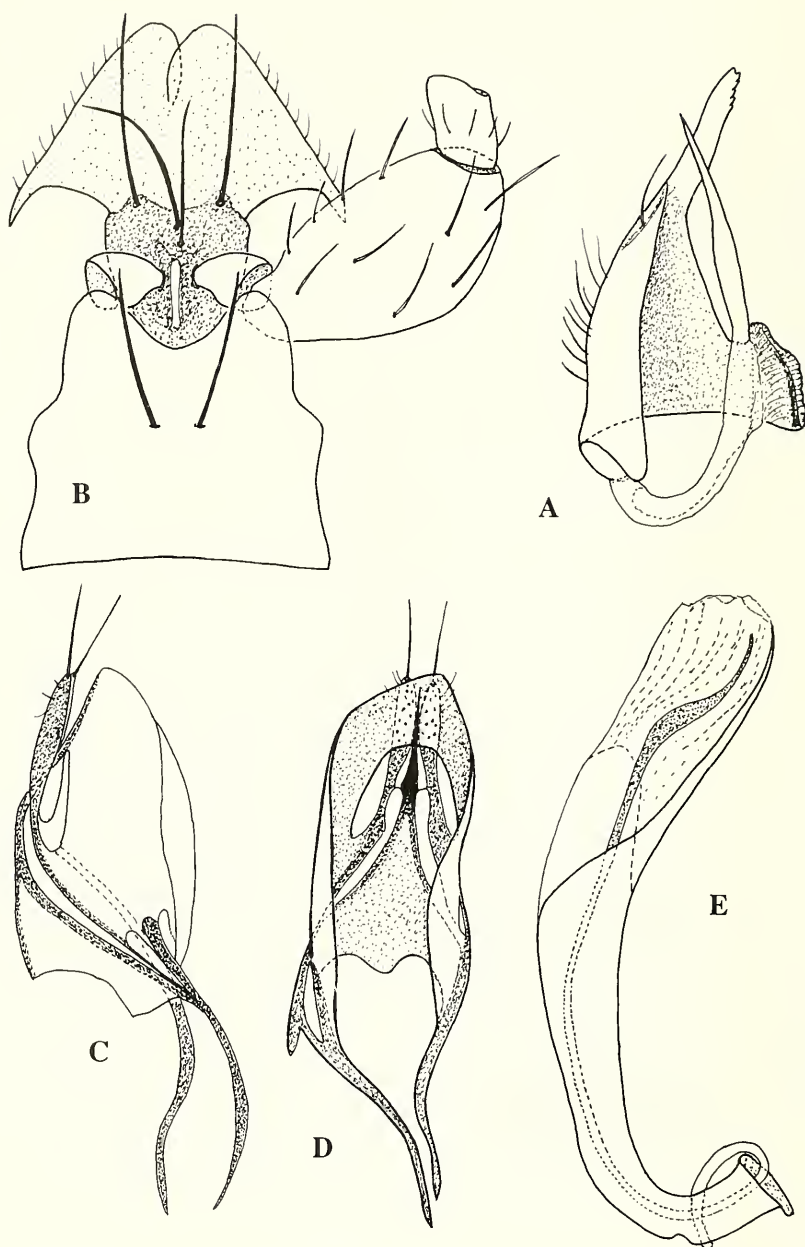


Fig. 86. *Glyptolopus* spp.: a - mandible; b - labium, ventral; c, d - tegmen, ventral and inner view; e - median lobe, ventral.

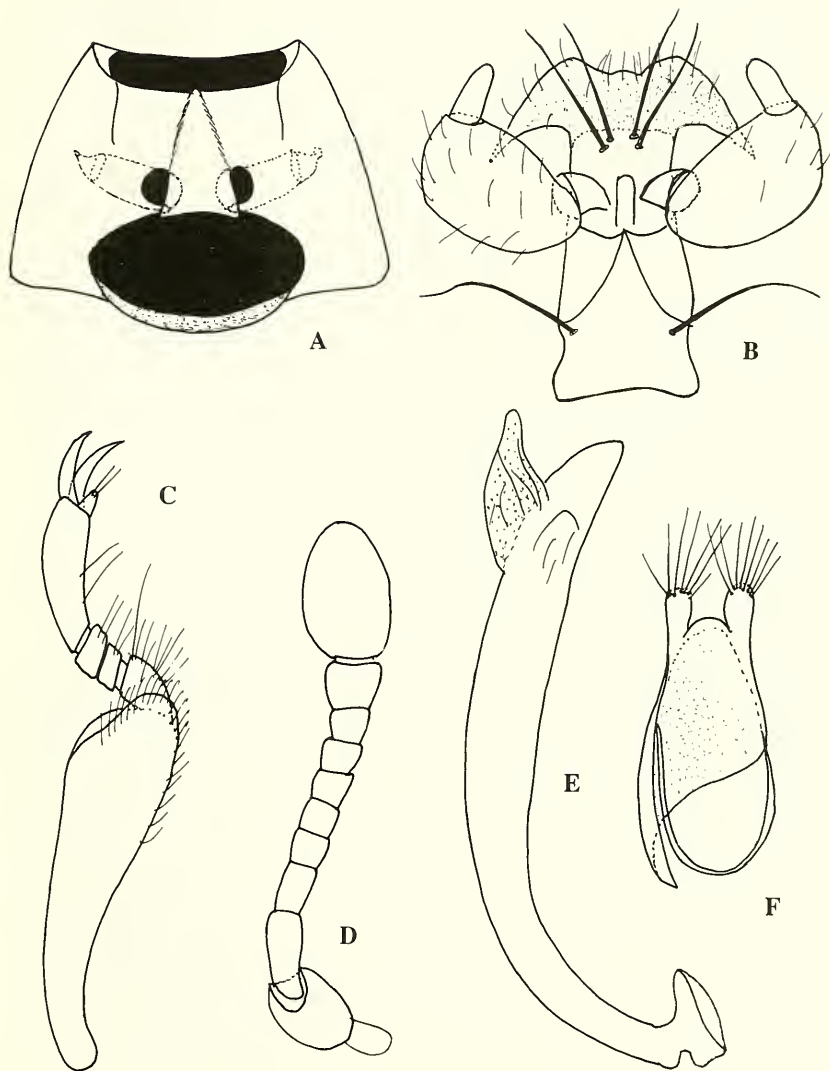


Fig. 87. *Ploeosoma ellipticum*: a - prothorax, ventral; b - labium, ventral; c - protibia and tarsus; d - antenna; e - median lobe, ventral; f - tegmen, inner view.

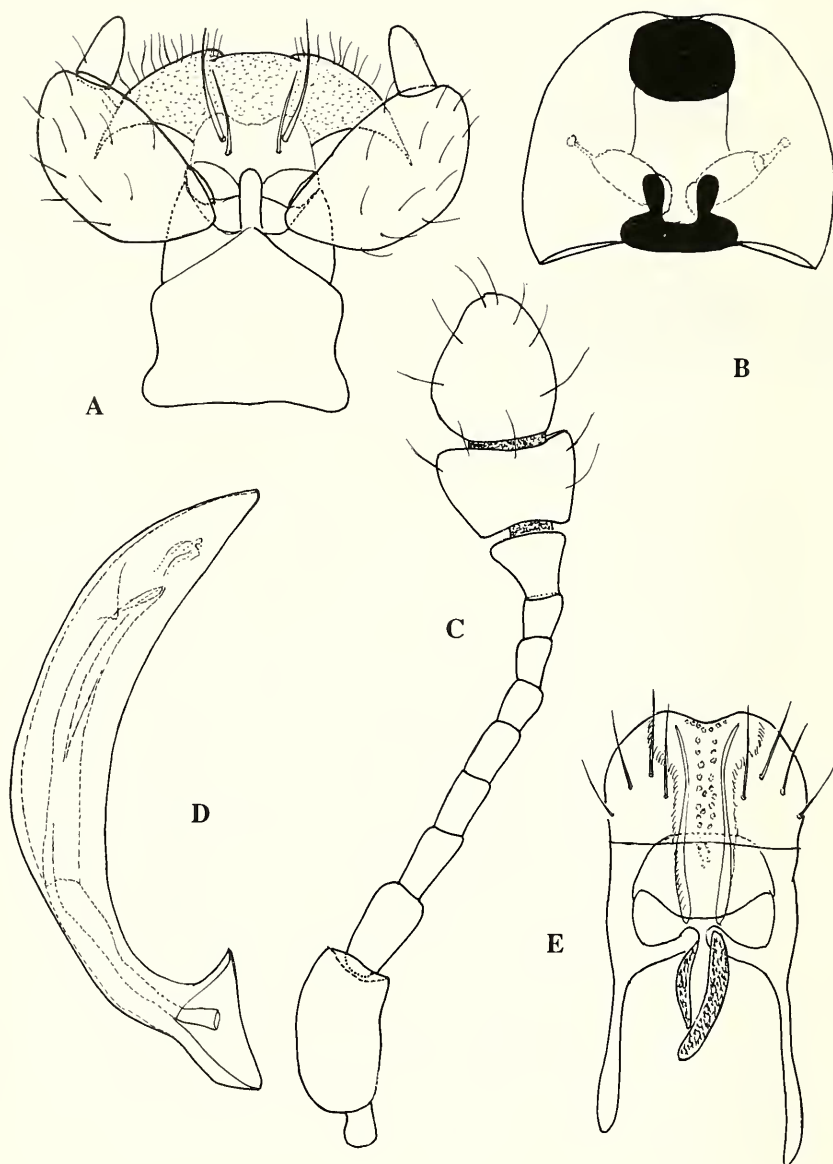


Fig. 88. *Coccilon* sp.: a - labium, ventral; b - prothorax, ventral; c - antenna; d - median lobe, ventral; e - labrum-epipharynx, dorsal.

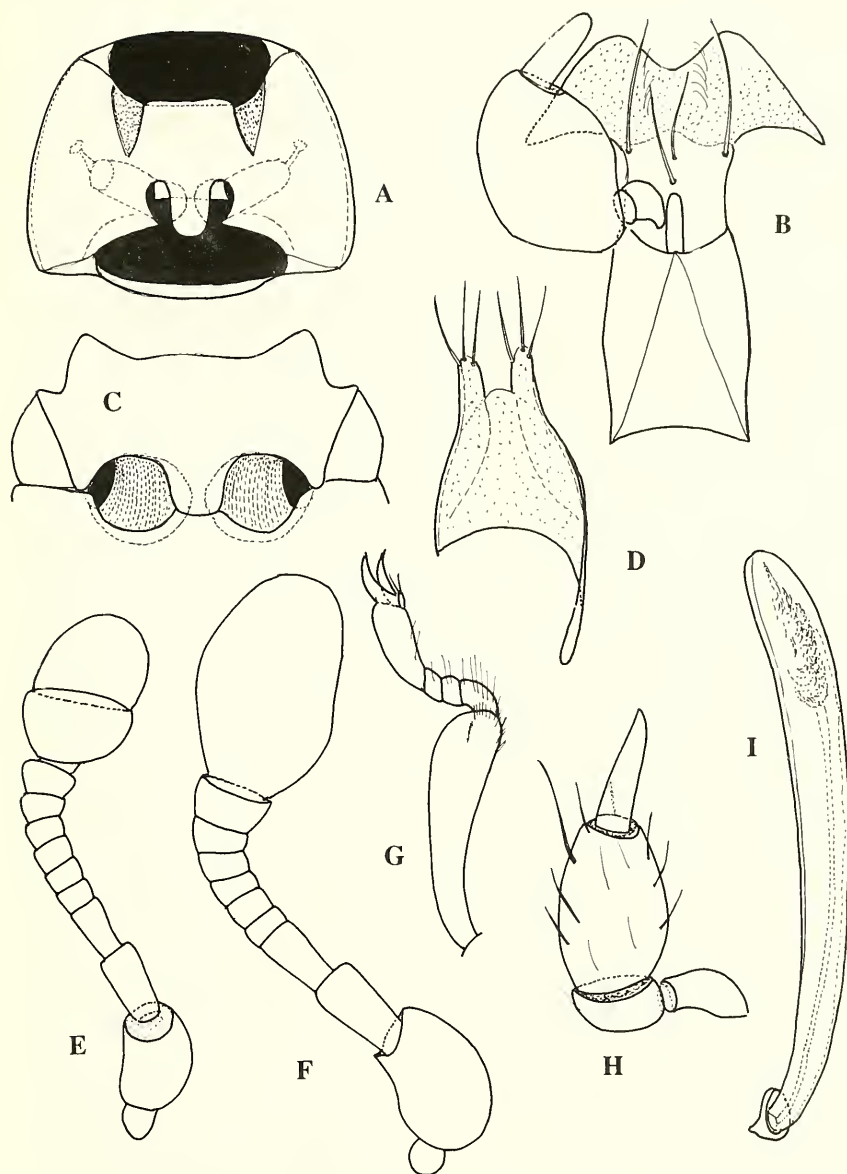


Fig. 89. *Pathelus* spp.: a - prothorax, ventral; b - labium, ventral; c - mesosternum, ventral; d - tegmen, inner view; e, f - antennae showing maximum degree of variation; g - protibia and tarsus; h - maxillary palps; i - median lobe, dorsal.

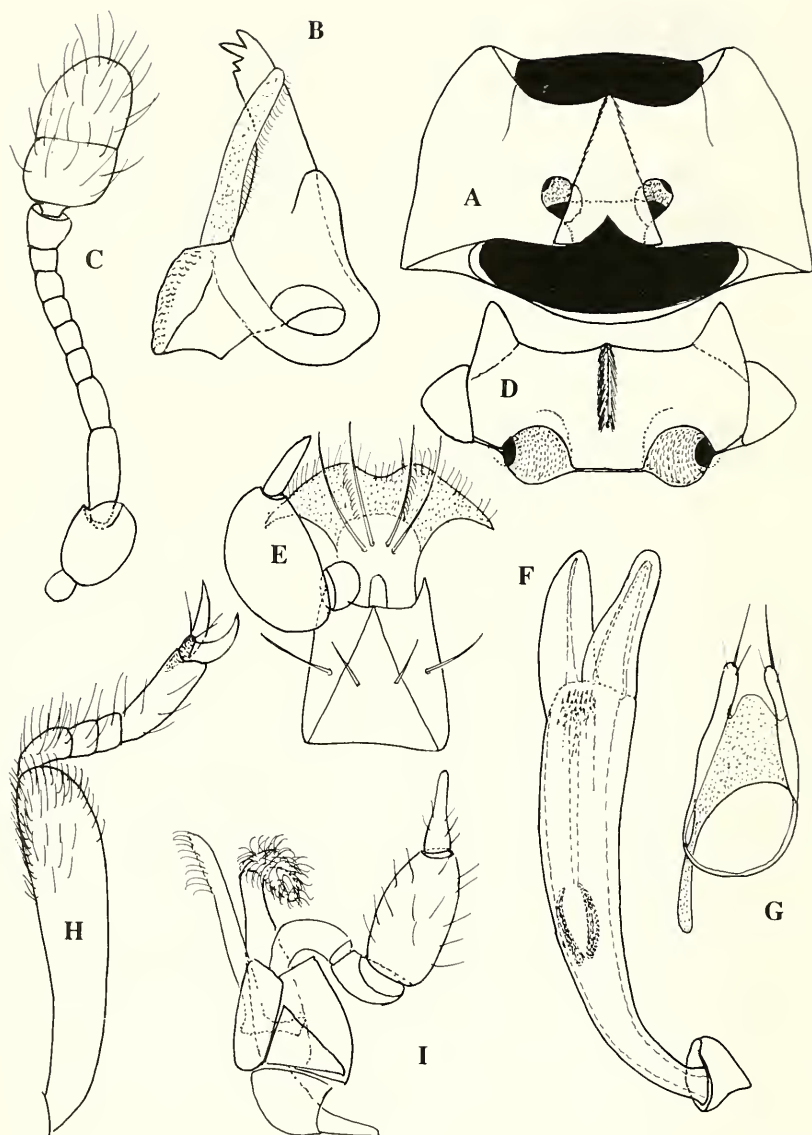


Fig. 90. *Ellipsorylon* sp.: a - prothorax, ventral view; b - mandible; c - antenna; d - mesosternum showing median carina; e - labium, ventral; f - median lobe, ventral; g - tegmen, inner view; h - protibia; i - maxilla, ventral.

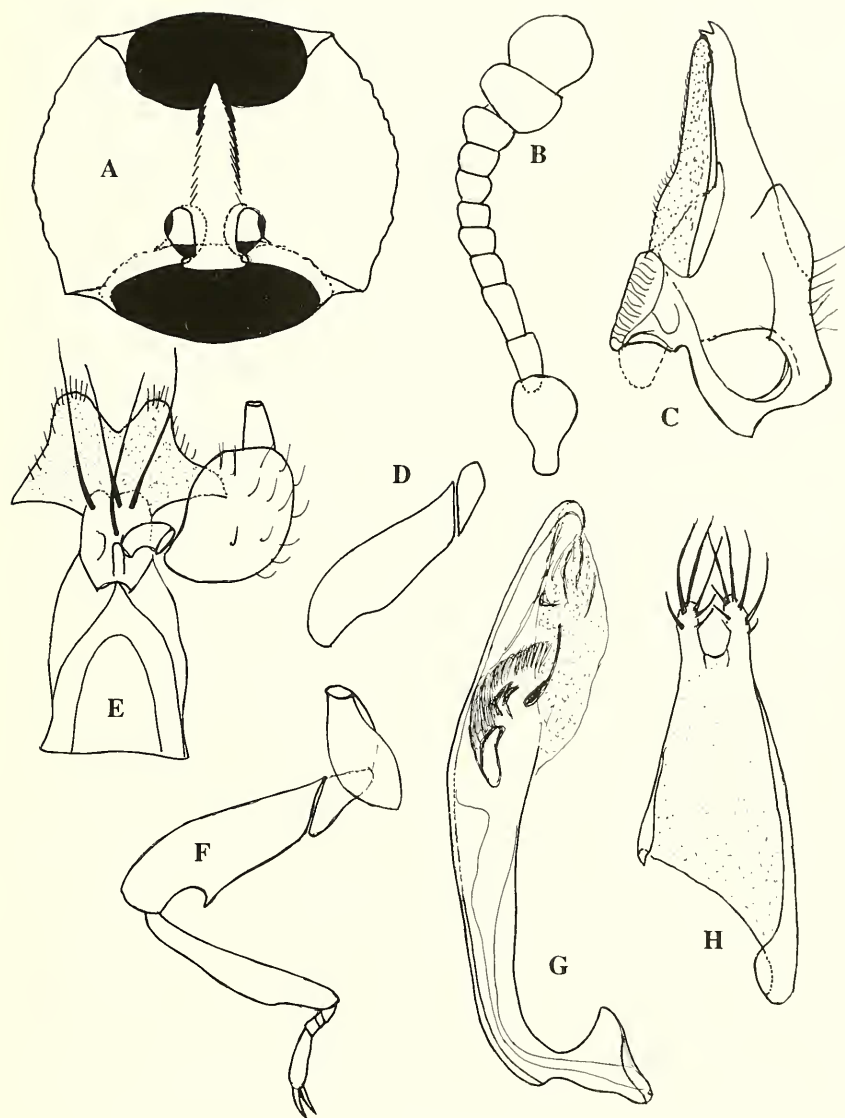


Fig. 91. *Acautomus armatus*: a - prothorax, ventral; b - antenna; c - mandible; d - midtibia of female; e - labium; f - hind leg of female; g - median lobe, ventral; h - tegmen, inner view.

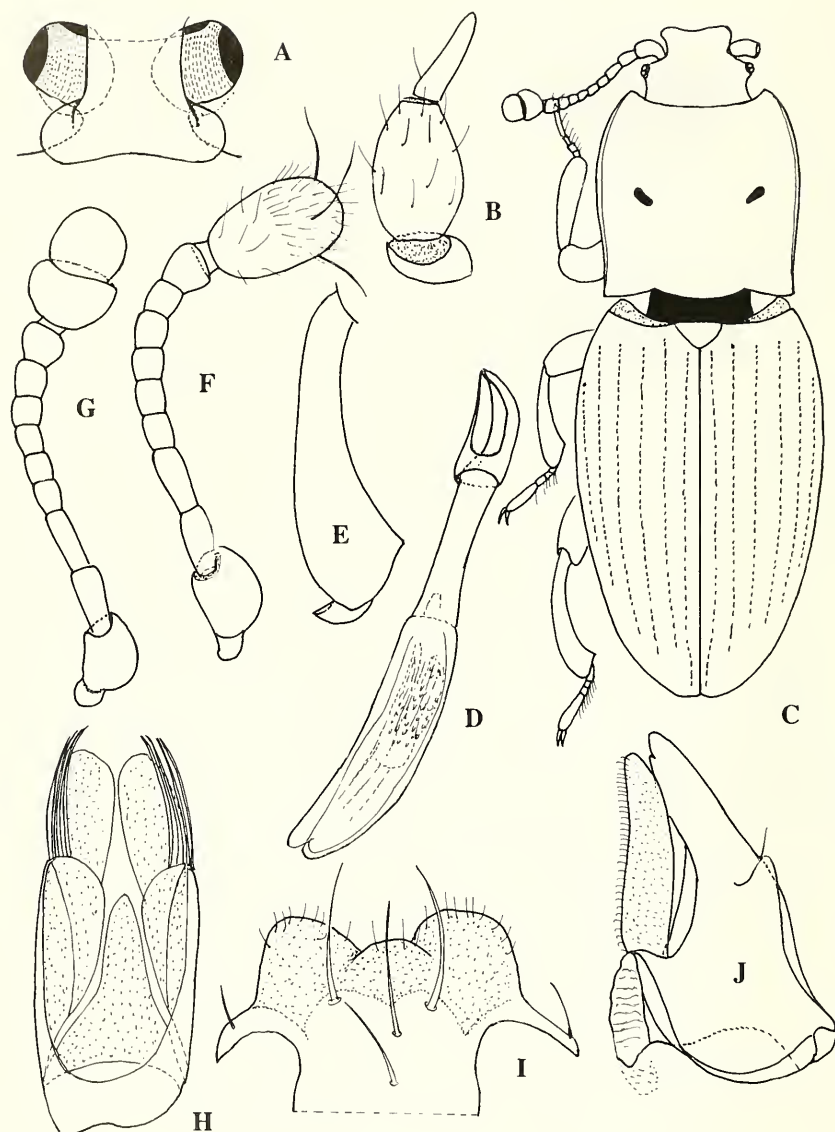


Fig. 92. *Spinocerylon* spp.: a - prosternal process and cavities; b - maxillary palps; c - outline of male; d - median lobe, ventral; e - hindtibia of male; f, g - antennae, maximum variation; h - tegmen, inner view; i - apical part of labium; j - mandible.

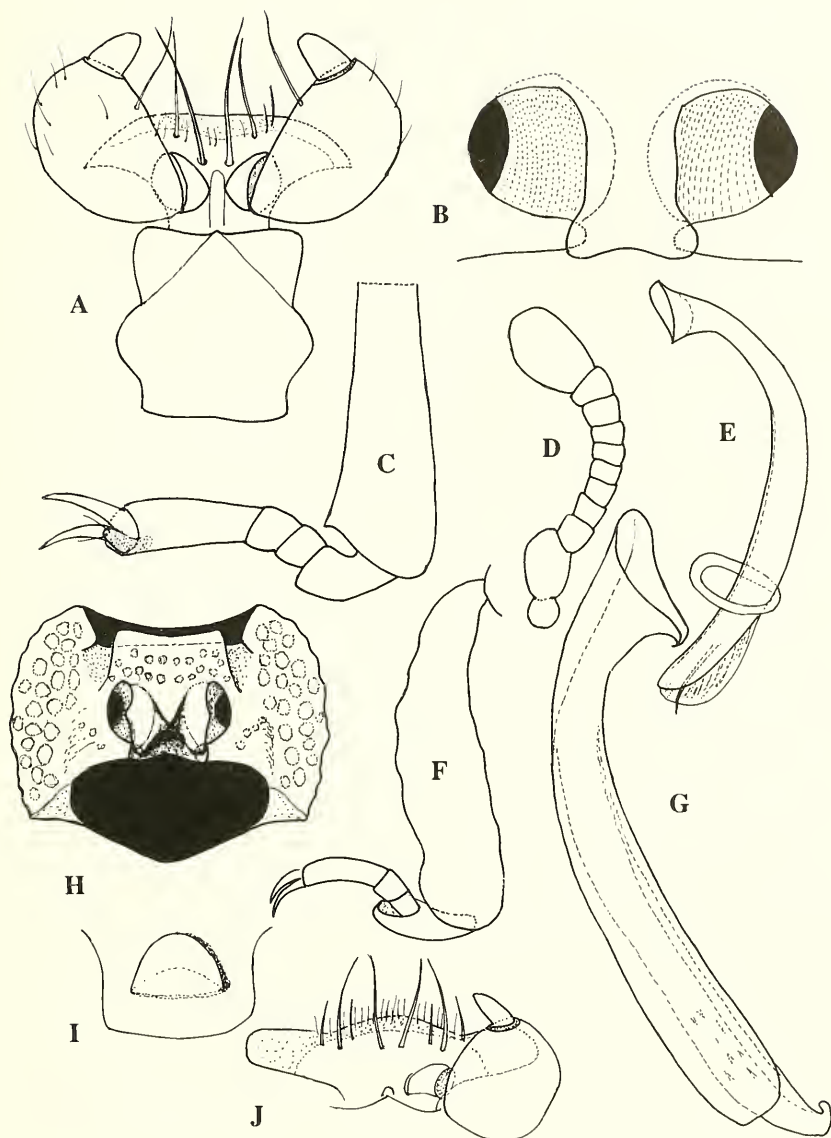


Fig. 93. *Pachylon* sp.: a - labium, ventral; b - prosternal process and cavities; c - protibia and tarsus; d - antenna; e - aedeagus, ventral. - *Gyreleon* sp.: f - protibia and tarsus; g - median lobe, dorsal; h - prothorax, ventral; i - mesosternum with raised knob; j - apical portion of labium, ventral.

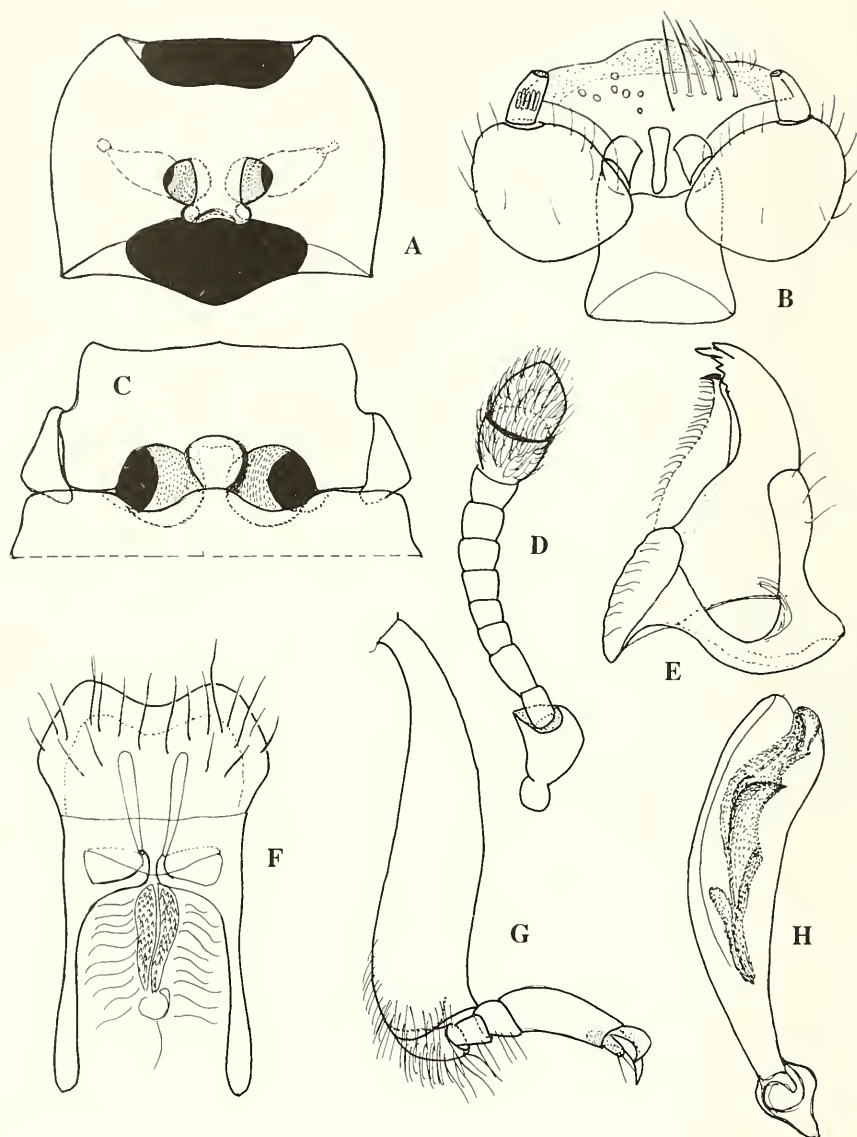


Fig. 94. *Clavicerylon* sp.: a - prothorax, ventral; b - labium, ventral; c - mesothorax, ventral showing mesosternal knob; d - antenna; e - mandible; f - labrum-epipharynx, dorsal; g - protibia and tarsus; h - median lobe, ventral.

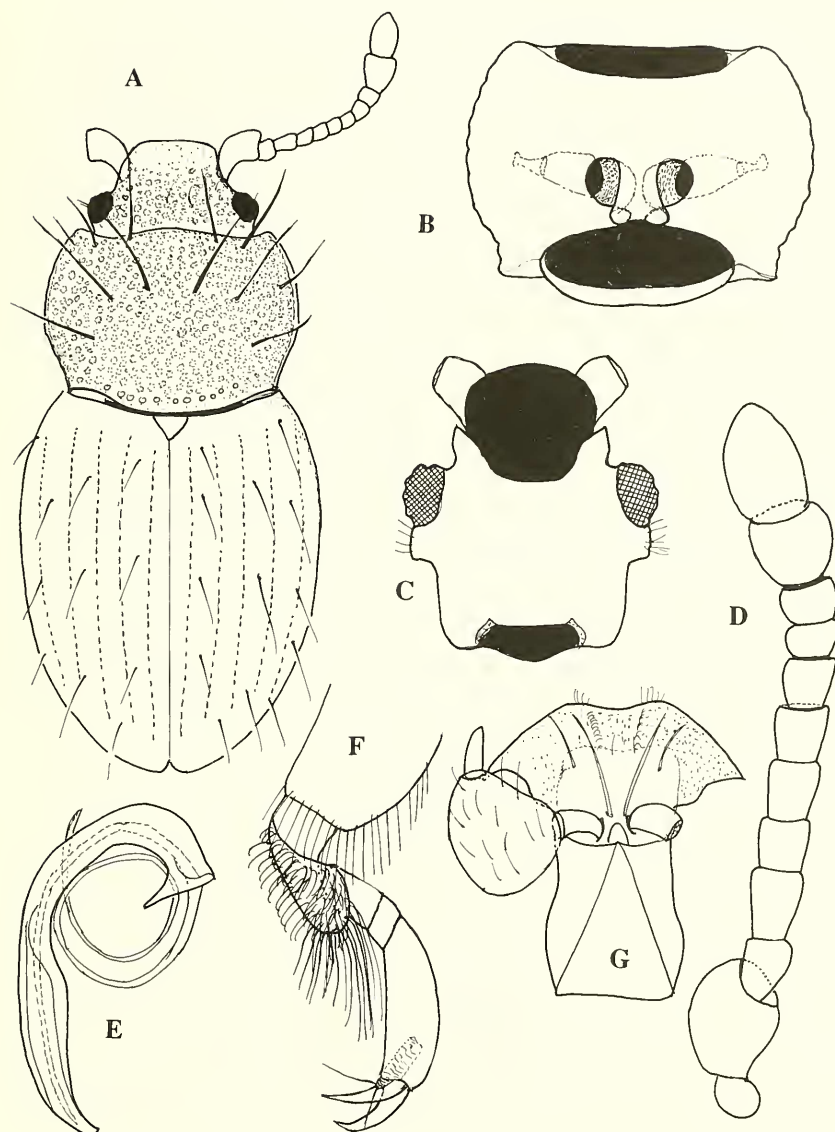


Fig. 95. *Oroussetia* sp.: a - outline of dorsal side; b - prothorax, ventral; c - head, ventral; d - antenna; e - median lobe, dorsal; f - male protarsus and tibial apex; g - labium, ventral.

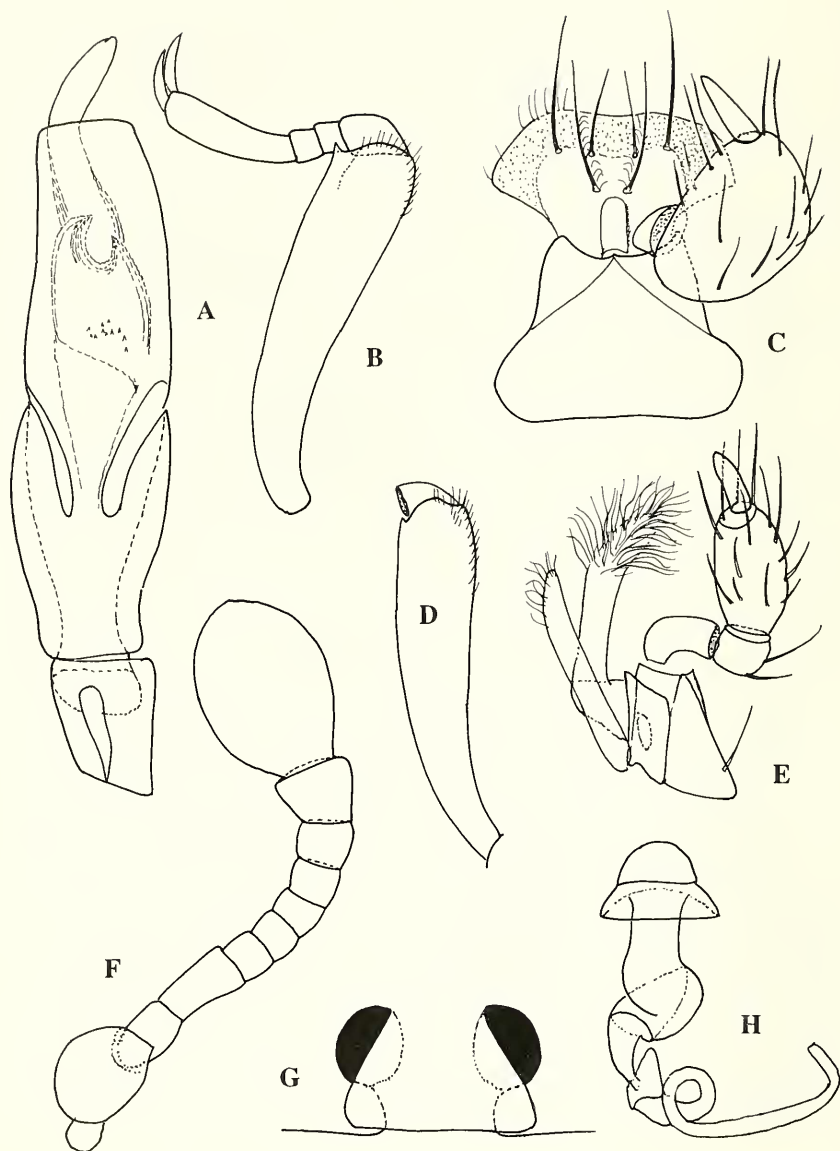


Fig. 96. *Paracerylon* spp.: a - median lobe, dorsal; b - protibia and tarsus; c - labium, ventral; d - protibia, showing maximum reduction of apical tooth; e - maxilla, dorsal; f - antenna; g - prosternal process and cavities; h - spermatheca.

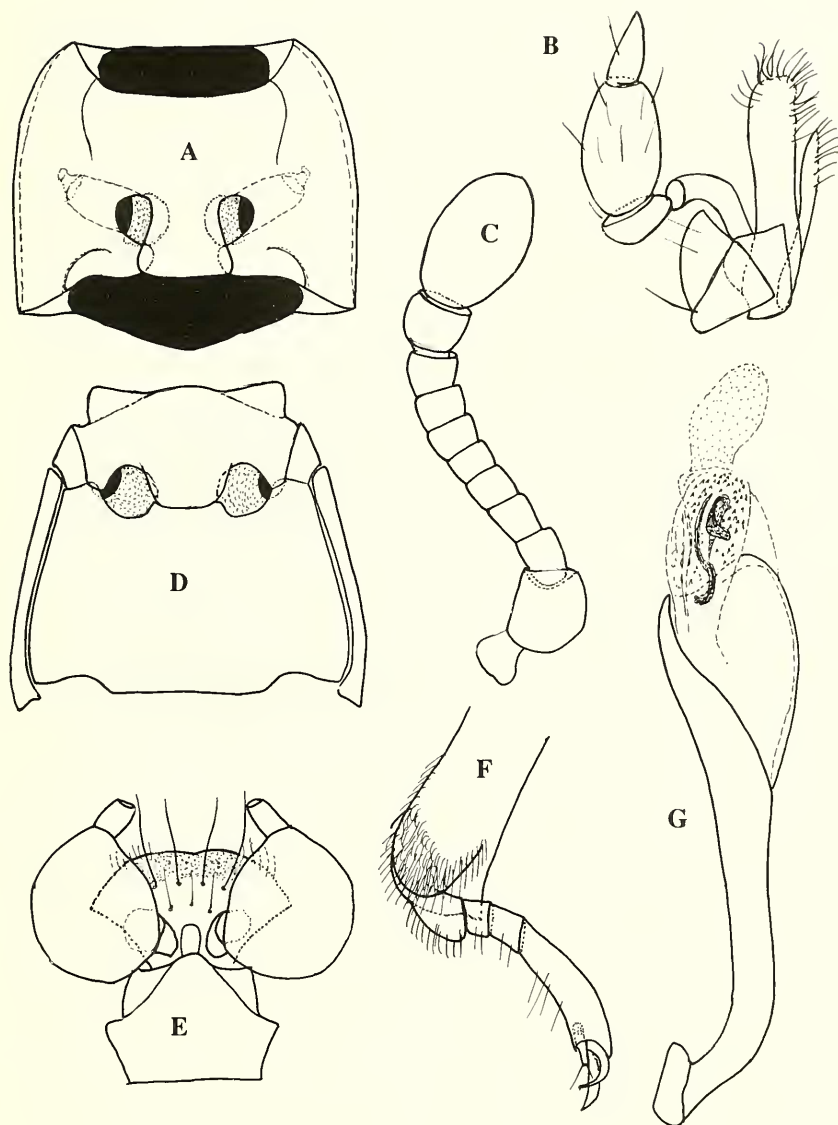


Fig. 97. *Cerylon histeroideus*: a - prothorax, ventral; b - maxilla, ventral; c - antenna; d - pterothorax, ventral; e - labium, ventral; f - protibia and tarsus; g - median lobe, ventral.

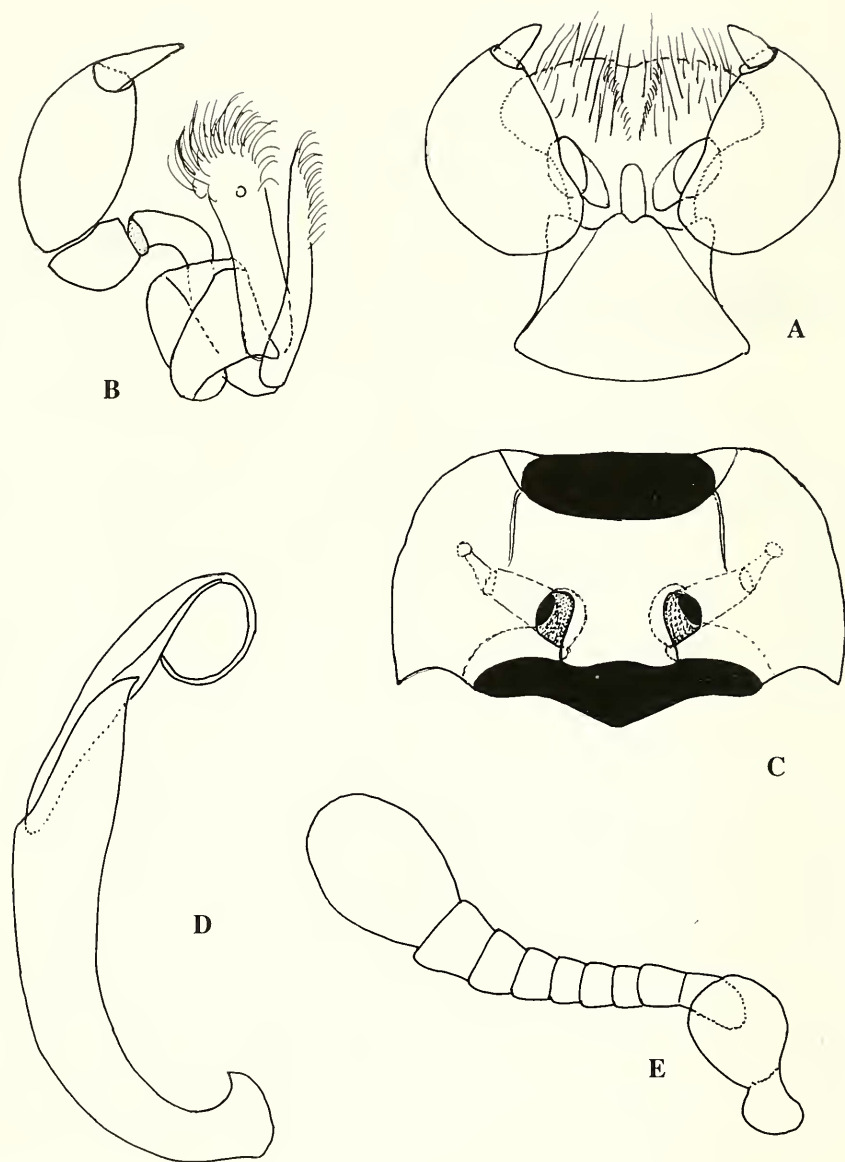


Fig. 98. *Pseudocerylon* sp.: a - labium, ventral; b - maxilla, dorsal; c - prothorax, ventral; d - median lobe, ventral; e - antenna.

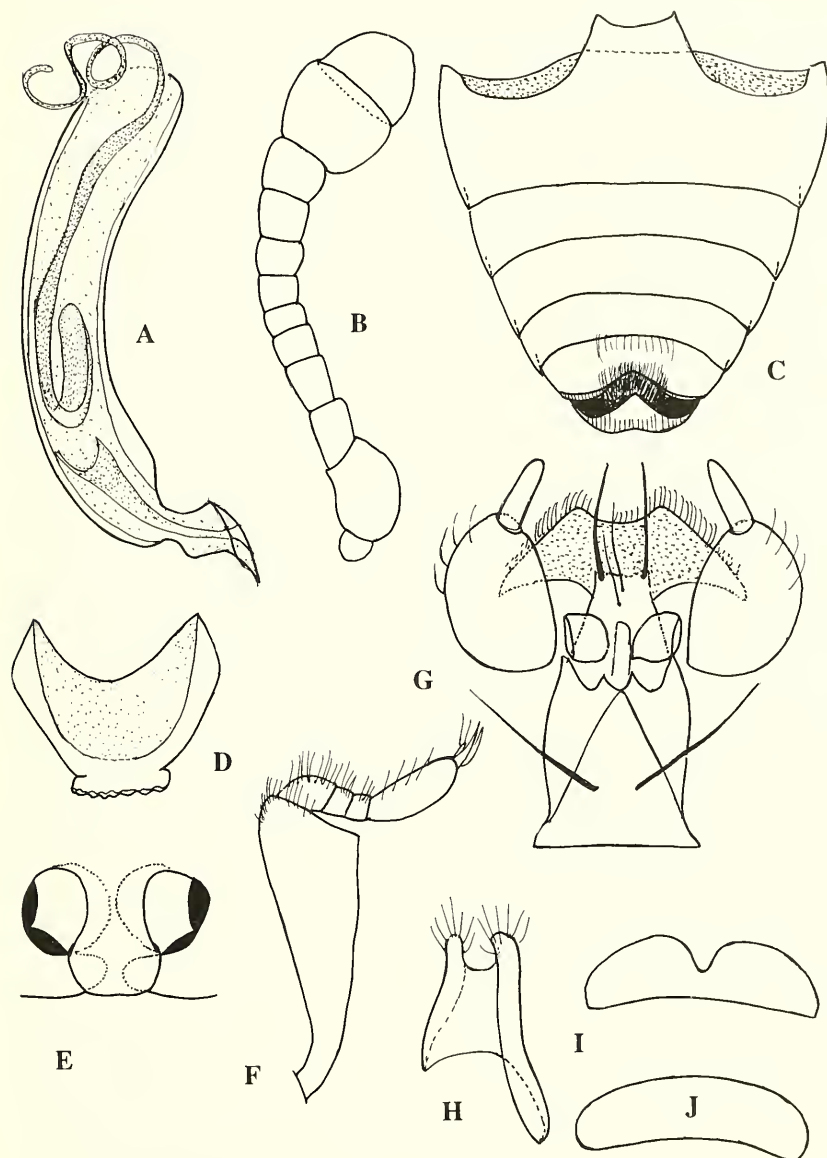


Fig. 99. *Australiorylon* sp.: a - median lobe, ventral; b - antenna; c - abdomen, ventral; d - male last visible tergite, ventral; e - prosternal process and cavities; f - protibia and tarsus; g - labium, ventral; h - tegmen, inner view; i - male clypeus; j - female of the same species.

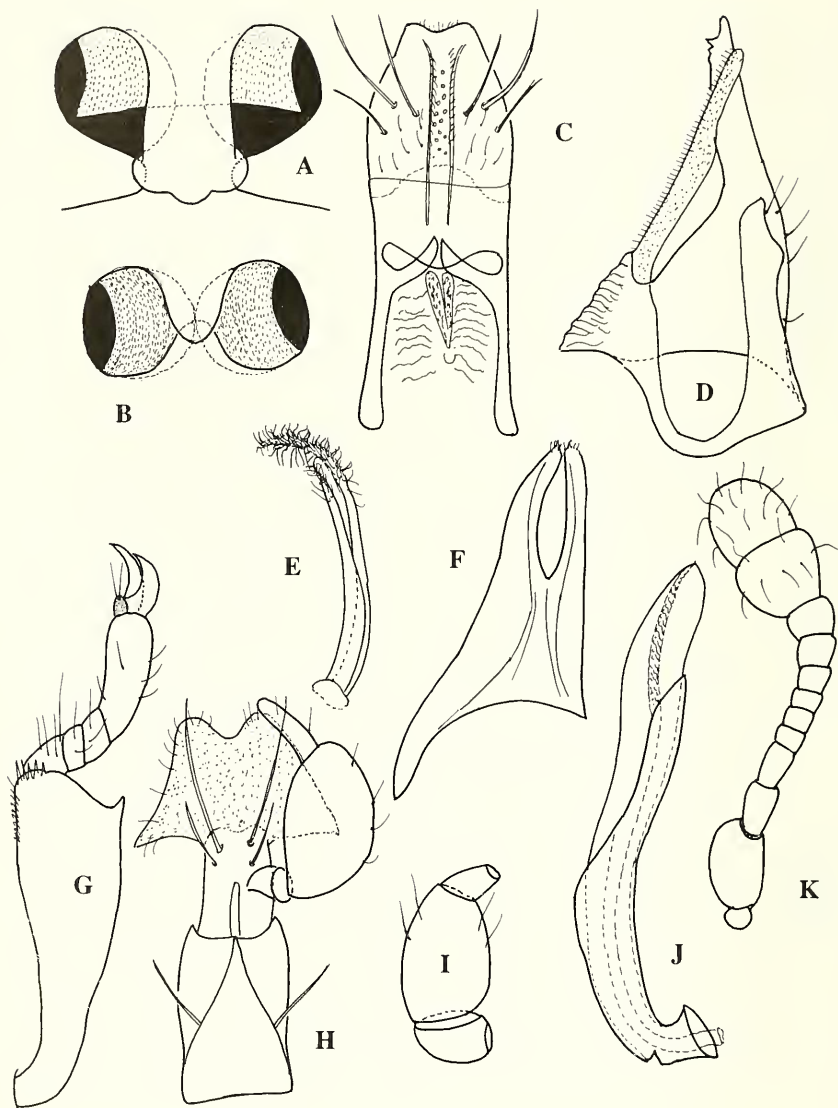


Fig. 100. *Orientrylon* sp.: a - prosternal process and cavities; b - mesosternal process and cavities; c - labrum-epipharynx, dorsal; d - mandible; e - maxillary galea and lacinia; f - tegmen, inner view; g - protibia and tarsus; h - labium, ventral; i - maxillary palps; j - median lobe, ventral; k - antenna.

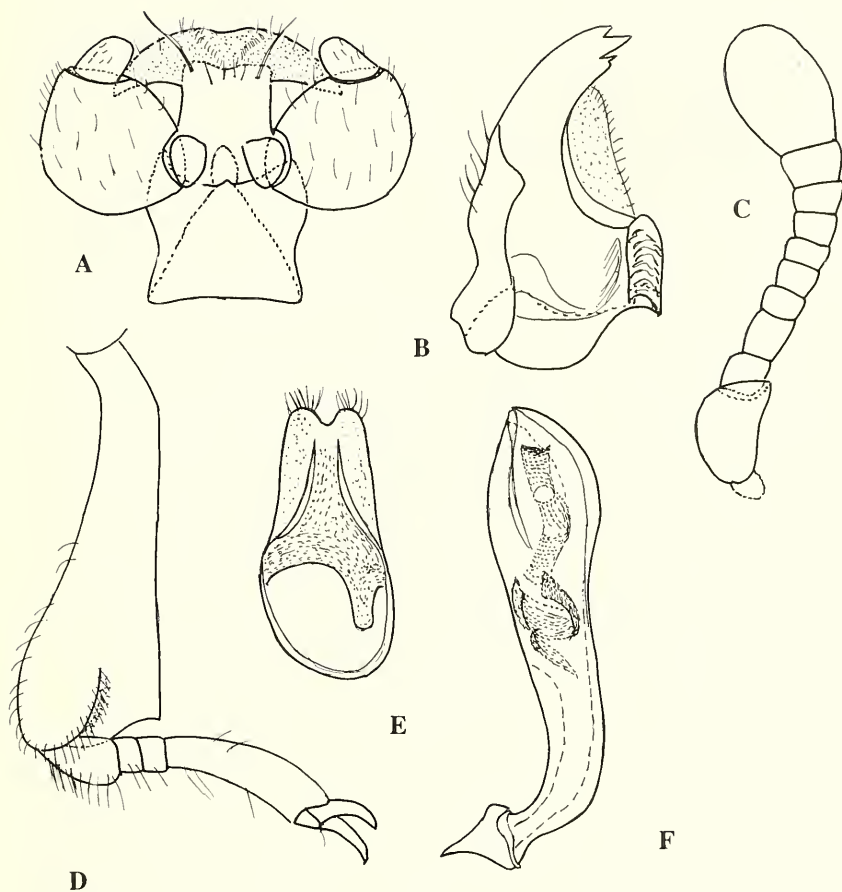


Fig. 101. *Afrorylon* sp.: a - labium, ventral; b - mandible; c - antenna; d - protibia and tarsus; e - tegmen, inner view; f - median lobe, ventral.

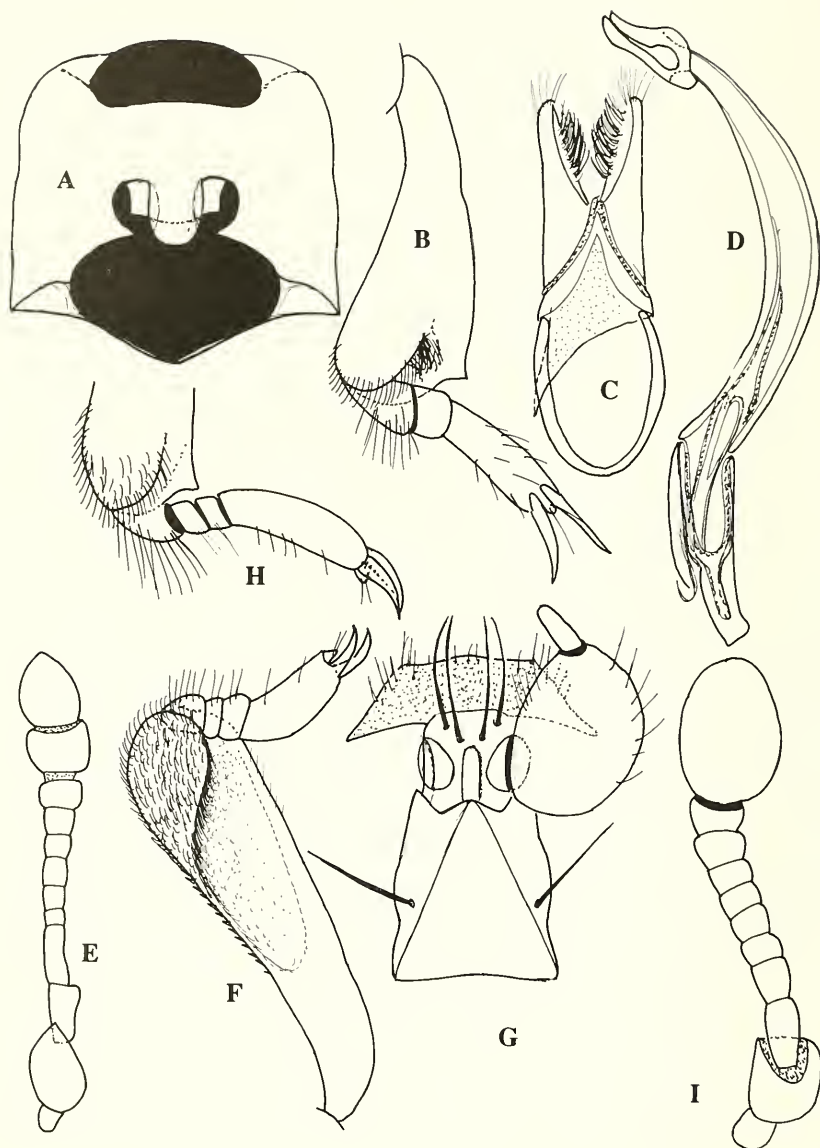


Fig. 102. *Philothermopsis* spp.: a - prothorax, ventral; b-d, g, i - *P. alluaudi*: b - protibia and tarsus; c - tegmen, inner view; d - median lobe, ventral; g - labium, ventral; i - antenna; e-f - *Lawrenciella costata*: e - antenna; f - protibia and tarsus; h - *P. hirtus* - male protibia and tarsus.

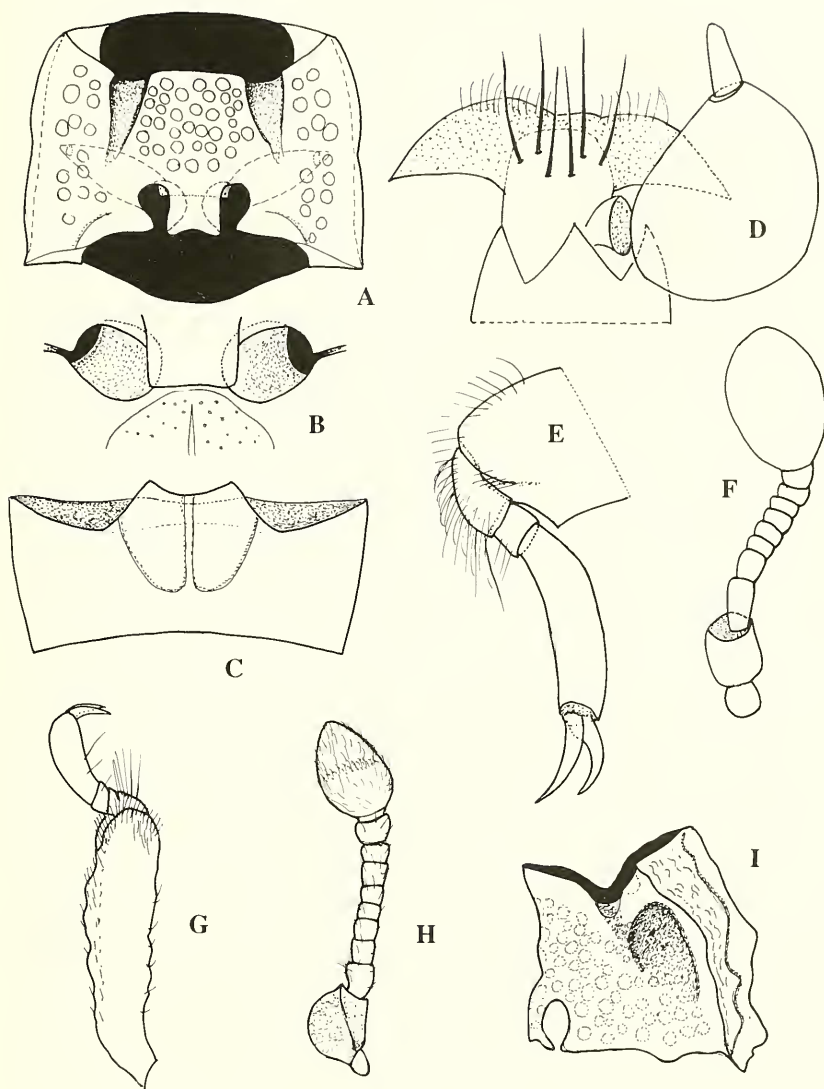


Fig. 103. *Belingaia* sp.: a - prothorax, ventral; b - mesocoxal process and femoral lines on metasternum; c - abdominal ventrite I; d - apical part of labium; e - apex of protibia and tarsus; f - antenna. g-i - *Ixius costatus*: g - protibia and tarsus; h - antenna; i - prothorax, lateral view.

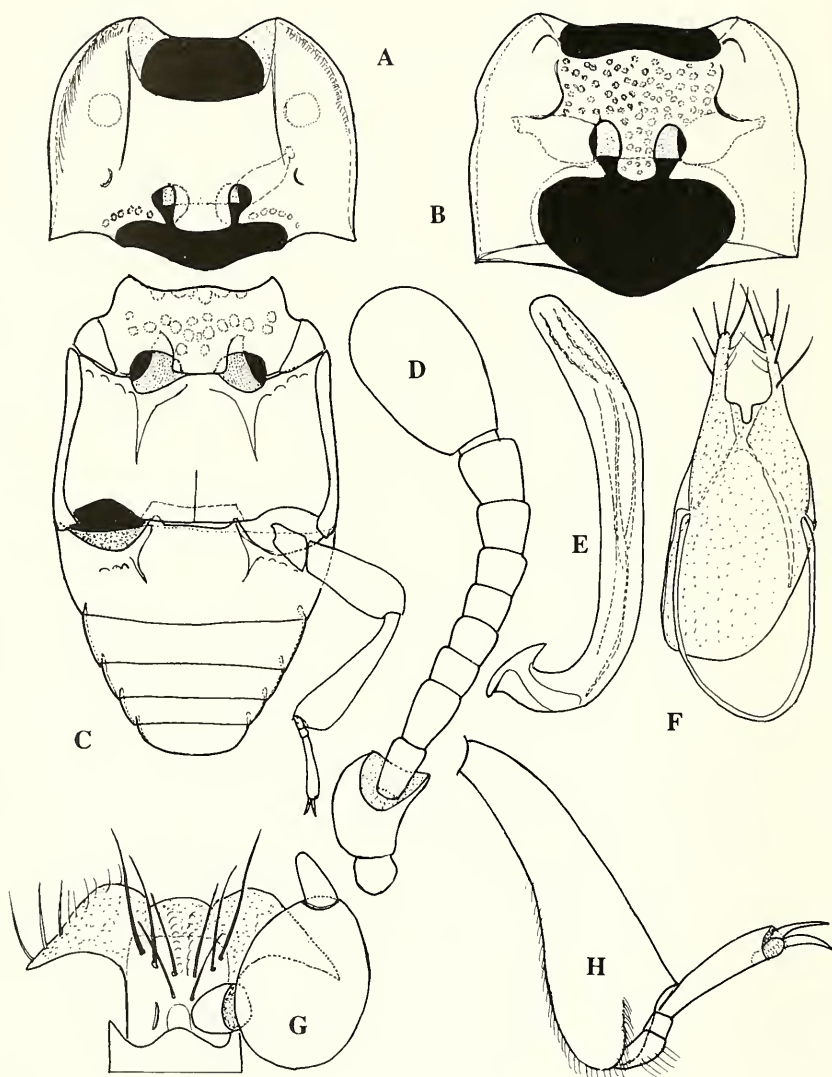


Fig. 104. *Suakokoia* spp.: a - prothorax, ventral of *S. szujeckii*; b - same of *S. gabonensis*; c - pterothorax and abdomen, ventral; d - antenna; e - median lobe, ventral; f - tegmen, inner view; g - apex of labium; h - protibia and tarsus.

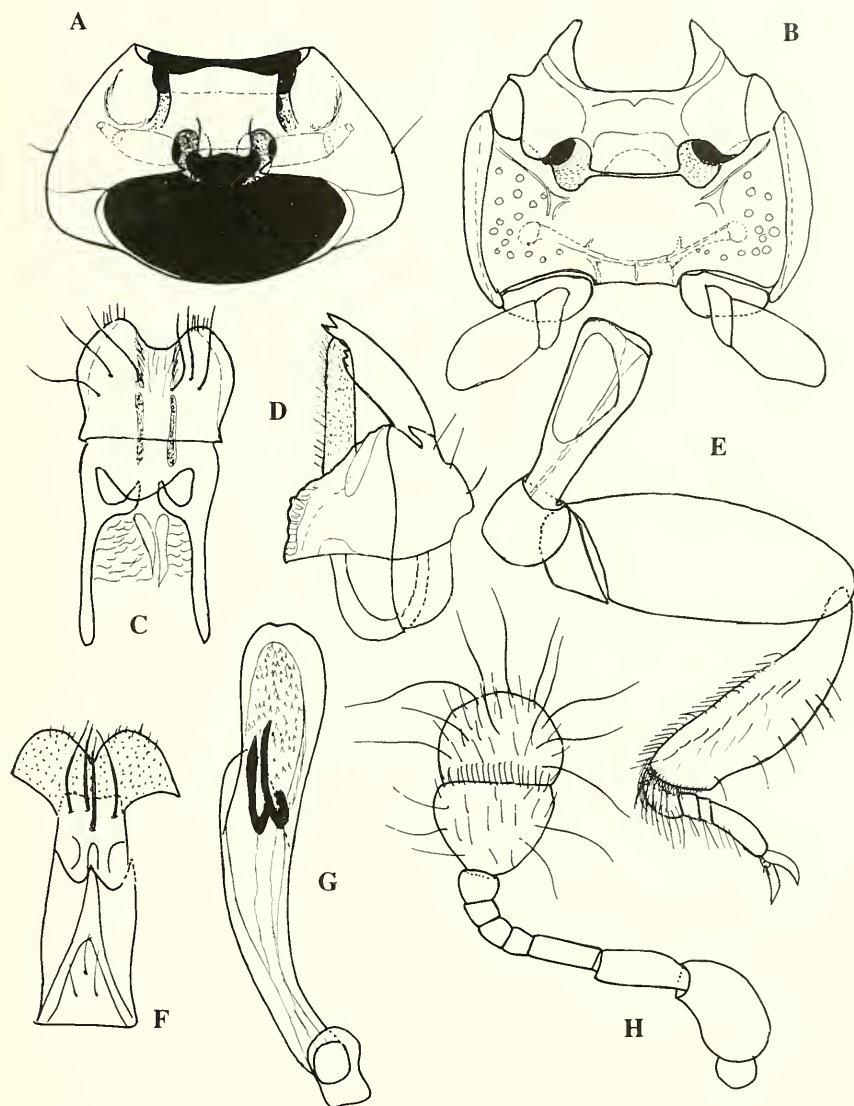


Fig. 105. *Glomerylon* sp.: a - prothorax, ventral; b - pterothorax, ventral; c - labrum-epipharynx, dorsal; d - mandible; e - prothoracic leg; f - labium, ventral (palps omitted); g - median lobe, dorsal; h - antenna.

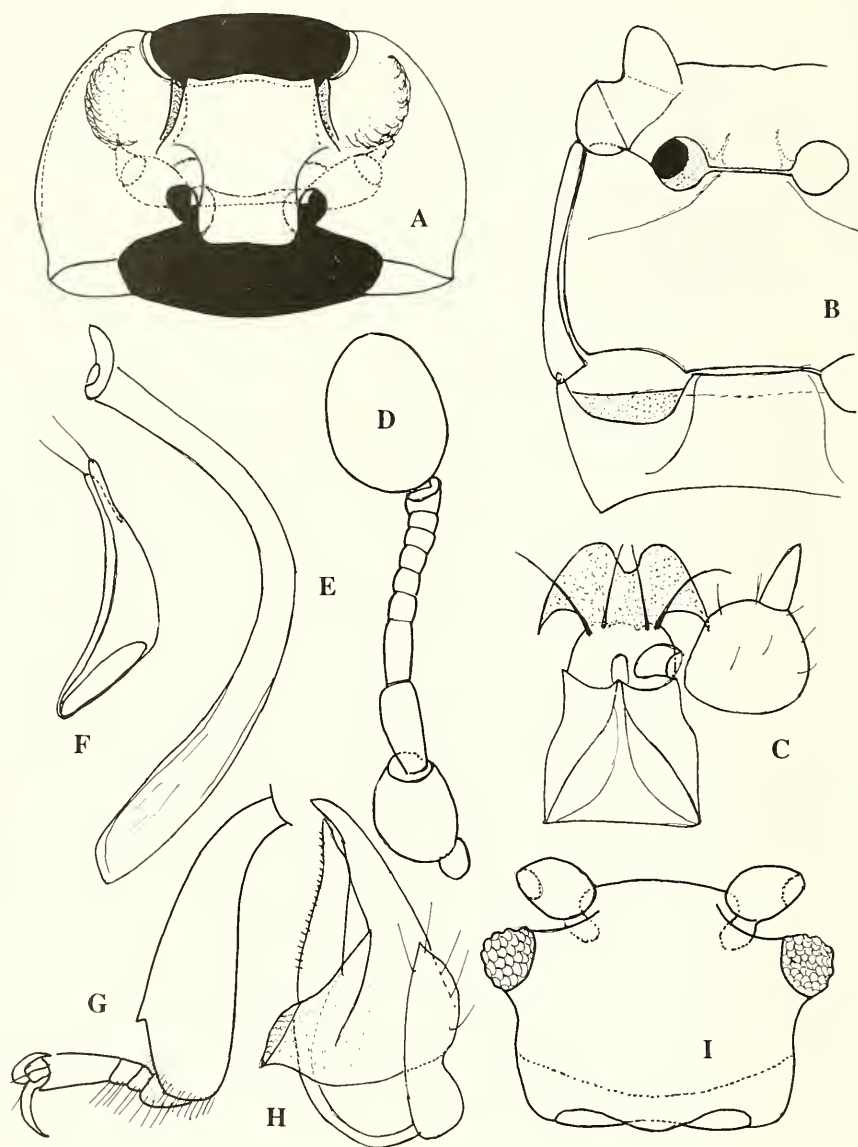


Fig. 106. *Lapethinus* sp.: a - prothorax, ventral; b - pterothorax and ventrite I, ventral; c - labium, ventral; d - antenna; e - median lobe, ventral; f - tegmen, ventral; g - protibia and tarsus; h - mandible; i - head, dorsal.

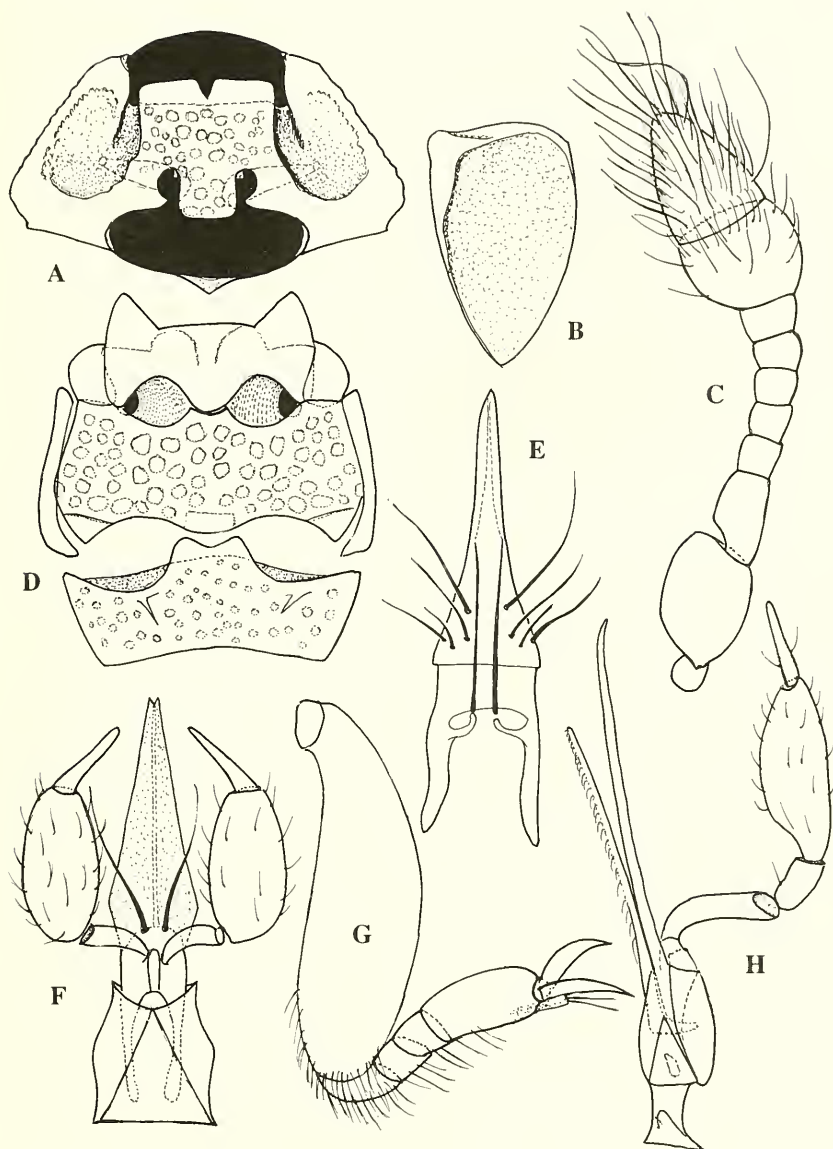


Fig. 107. *Rostrorylon vaucheri*: a - prothorax, ventral; b - elytron, ventral; c - antenna; d - pterothorax and ventrite I, ventral; e - labrum-epipharynx, dorsal; f - labium, dorsal; g - protibia and tarsus; h - maxilla, ventral.

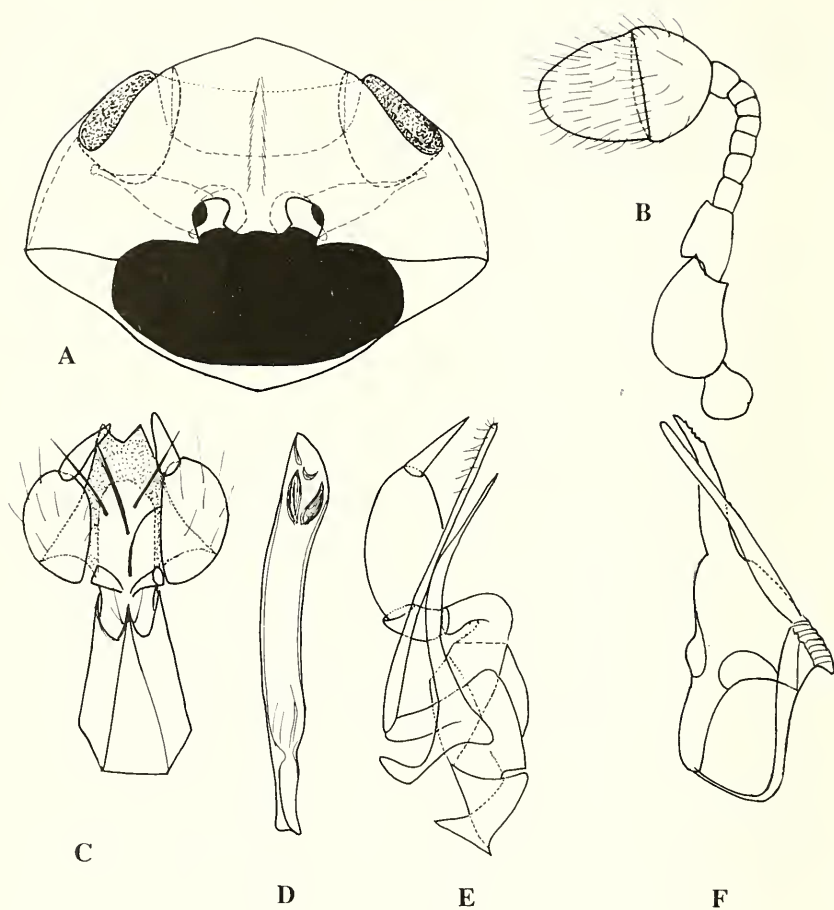


Fig. 108. *Neolapethus orientalis*: a - prothorax, ventral; b - antenna; c - labium, ventral; d - median lobe (slightly deformed, teneral specimen); e - maxilla, dorsal; f - mandible.

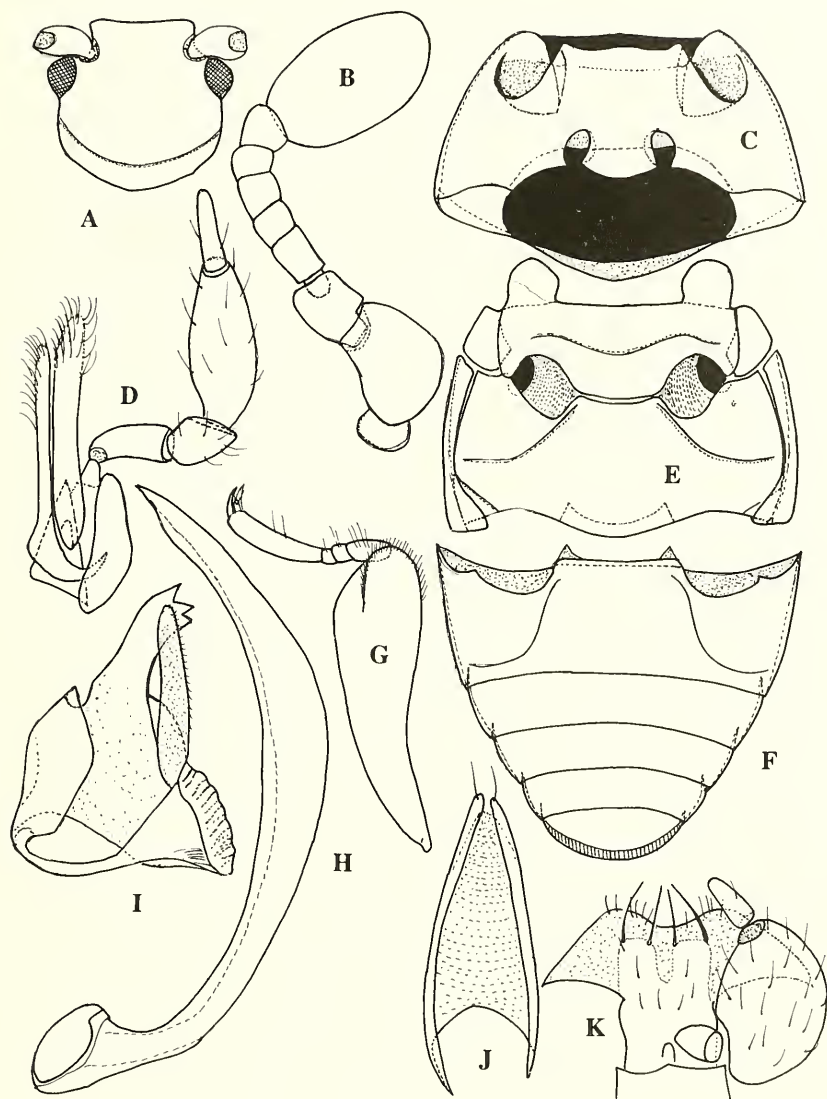


Fig. 109. *Mychocerus* spp.: a - head, dorsal; b - antenna; c - prothorax, ventral; d - maxilla, dorsal; e - pterothorax, ventral; f - abdomen, ventral; g - protibia and tarsus; h - median lobe, dorsal; i - mandible; j - tegmen, inner view; k - labium, apical part, ventral.

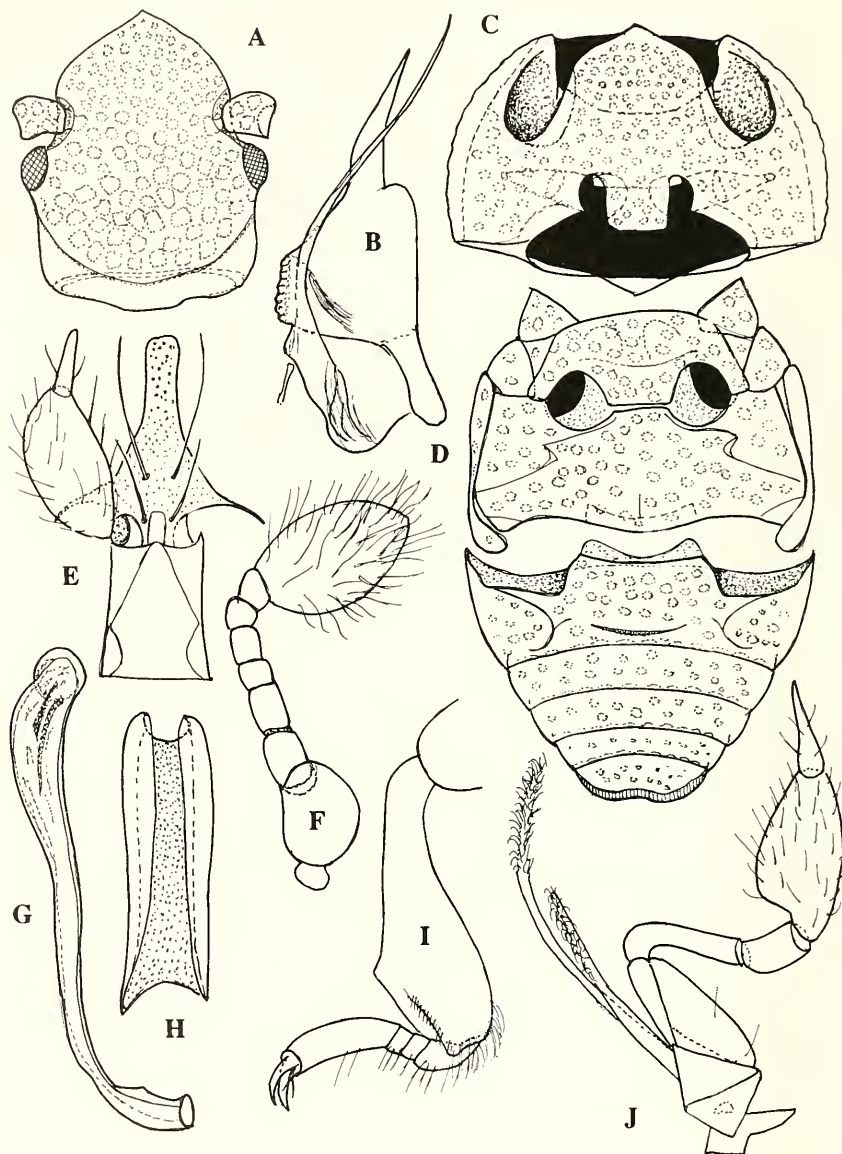


Fig. 110. *Pseudolapethus* sp.: a - head, dorsal; b - mandible; c - prothorax, ventral; d - pterothorax and abdomen, ventral; e - labium, ventral; f - antenna; g - median lobe, ventral; h - tegmen, inner, view; i - protibia and tarsus; j - maxilla, ventral.

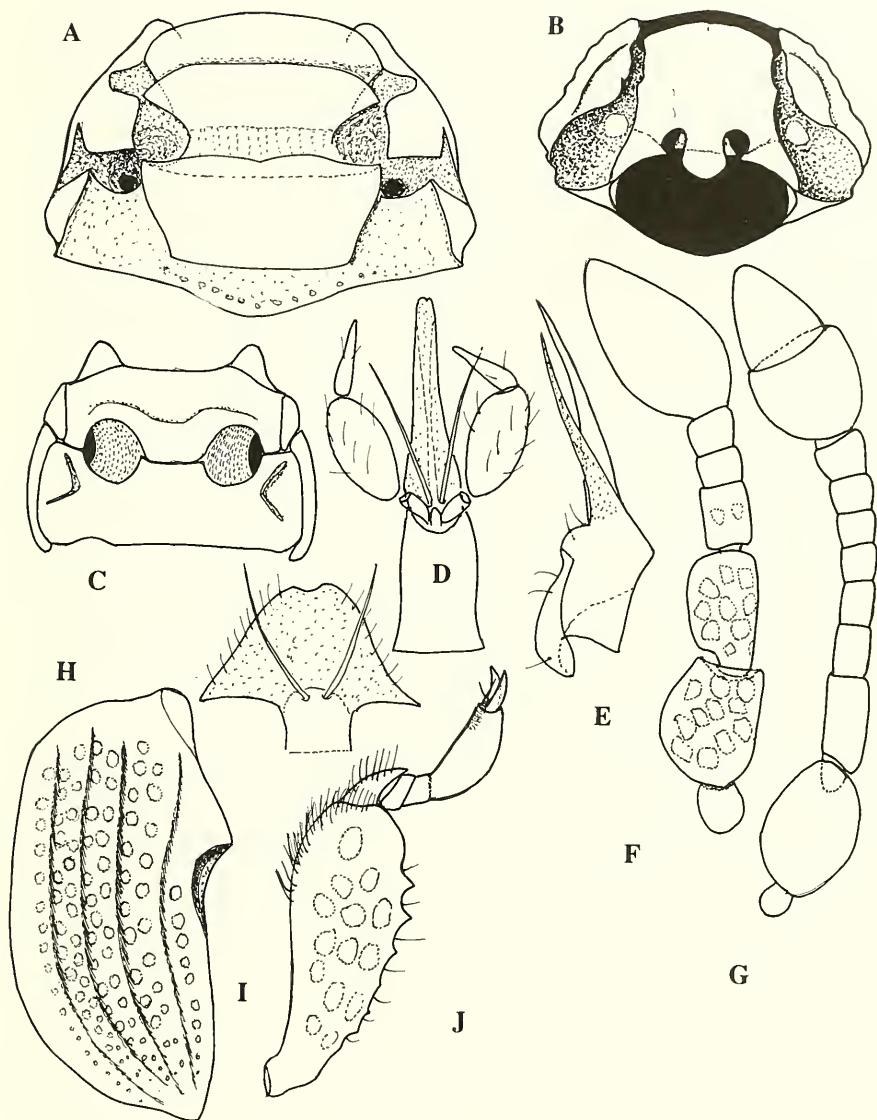


Fig. 111. *Axiocerylon* spp.: a - prothorax, dorsal; b - same, ventral; c - pterothorax; d - labium, ventral; f - mandible; f, g - antennae, maximum variation; h - ligula of *A. loebli*; i - elytron, lateral, showing dentate epipleuron; j - protibia and tarsus.

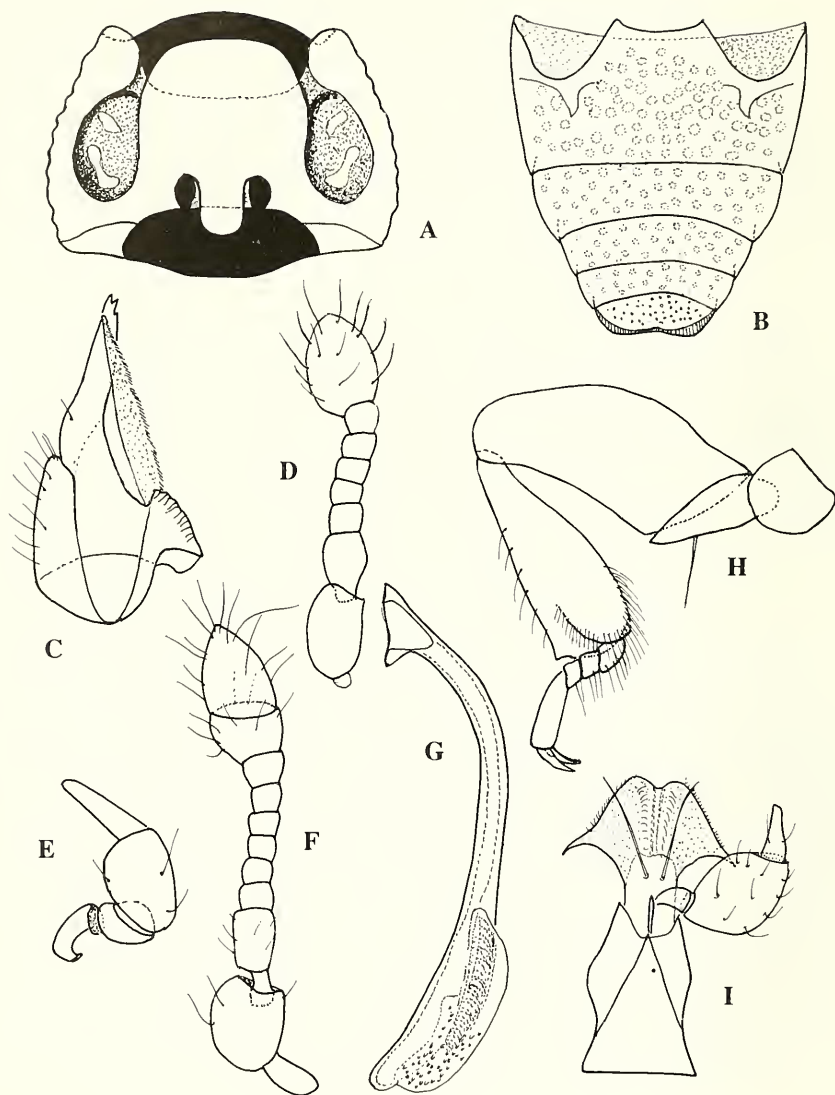


Fig. 112. *Thyroderus* spp.: a - prothorax, ventral; b - abdomen, ventral; c - mandible; d, f - antenna, maximum variation; e - maxillary palps; g - median lobe, ventral; h - prothoracic leg; i - labium, ventral.

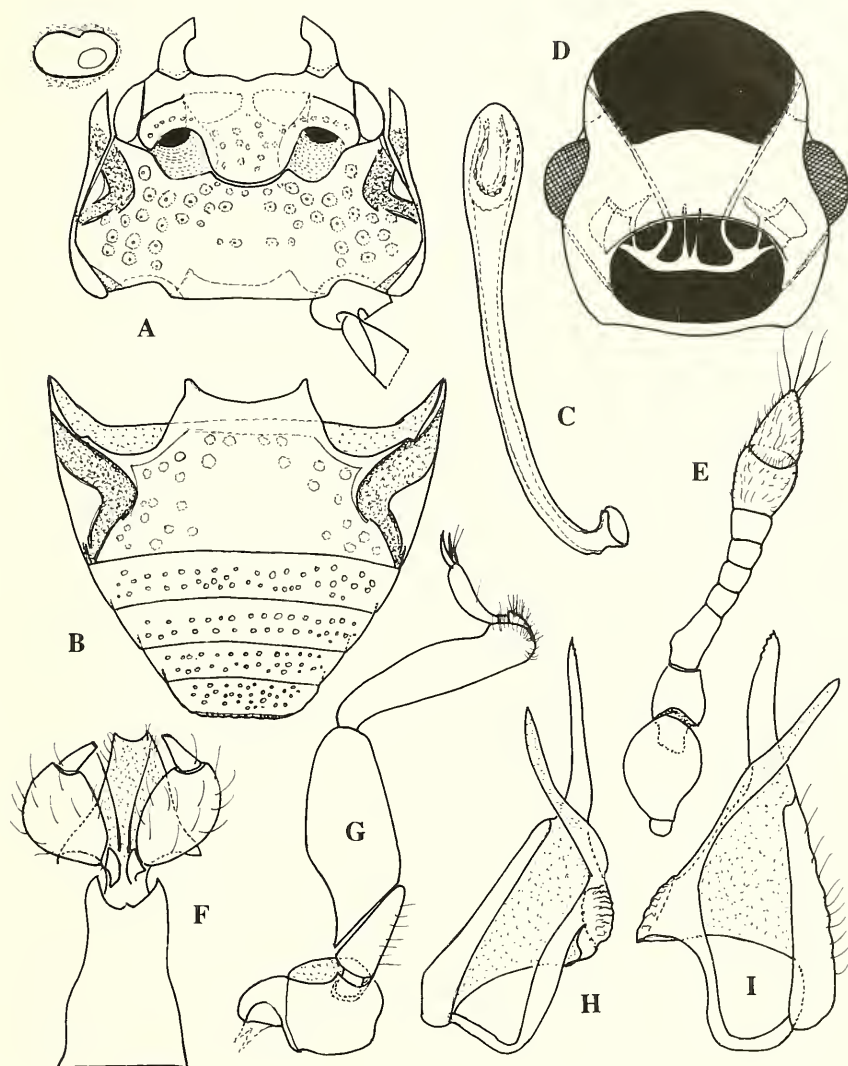


Fig. 113. *Angolon machadoi*: a - pterothorax, ventral, detail shows mesosternal puncture; b - abdomen, ventral; c - median lobe, ventral; d - head, ventral; e - antenna; f - labium, ventral; g - prothoracic leg; h - mandible, inner view; i - same, dorsal.

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VI. APPENDICES

A) NEW COMBINATIONS

<i>abnormis</i>	Slipinski	<i>Philothermopsis</i>	from <i>Cerylonopsis</i>
<i>addendus</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylon</i>
<i>alae</i>	Slipinski	<i>Pathelus</i>	from <i>As</i>
<i>alicjae</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>alienigenus</i>	Blackburn	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>alluadi</i>	Dajoz	<i>Pathelus</i>	from <i>Solumia</i>
<i>amaroides</i>	Chevrolat	<i>Metacerylon</i>	from <i>Cerylon</i>
<i>amplicolis</i>	Fairmaire	<i>Afrorylon</i>	from <i>Cerylon</i>
<i>angolanus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>ankaratrae</i>	Dajoz	<i>Philothermus</i>	from <i>Cerylon</i>
<i>antennatus</i>	Dajoz	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>antennatus</i>	Slipinski	<i>Metaxestus</i>	from <i>Metacerylon</i>
<i>apicalis</i>	Grouvelle	<i>Afrorylon</i>	from <i>Cerylon</i>
<i>arizonensis</i>	Lawrence & Stephan	<i>Mychocerus</i>	from <i>Mychocerus</i>
<i>astrolabei</i>	Heinze	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>australis</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>australis</i>	Slipinski	<i>Philothermopsis</i>	from <i>Cerylonopsis</i>
<i>baloghi</i>	Slipinski	<i>Orientrylon</i>	from <i>Cerylon</i>
<i>besucheti</i>	Slipinski	<i>Pathelus</i>	from <i>Illerylon</i>
<i>bicolor</i>	Grouvelle	<i>Metaxestus</i>	from <i>Cerylon</i>
<i>biroi</i>	Heinze	<i>Paracerylon</i>	from <i>Cerylon</i>
<i>borneensis</i>	Hinton	<i>Afrorylon</i>	from <i>Cerylon</i>
<i>braminus</i>	Motschulsky	<i>Paracerylon</i>	from <i>Cerylon</i>
<i>brevicollis</i>	Fairmaire	<i>Metacerylon</i>	from <i>Cerylon</i>
<i>brevis</i>	Motschulsky	<i>Cautomus</i>	from <i>Philothermus</i>
<i>brevis</i>	Gorham	<i>Mychocerus</i>	from <i>Brachylon</i>
<i>caledonicus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>camerunensis</i>	Sen Gupta & Crowson	<i>Afrorylon</i>	from <i>Philothermus</i>
<i>camerunensis</i>	Dajoz	<i>Suakokoia</i>	from <i>Ahalaia</i>
<i>carinatus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>catena</i>	Grouvelle	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>centralis</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>cerylonoides</i>	Heinze	<i>Philothermus</i>	from <i>Cautomus</i>
<i>clypealis</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>compactum</i>	Dajoz	<i>Gyreon</i>	from <i>Pseudocerylon</i>
<i>compactus</i>	Sharp	<i>Mychocerus</i>	from <i>Lytopeplus</i>
<i>convexus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>costata</i>	Slipinski	<i>Lawrenciella</i>	from <i>Lawrencella</i>
<i>crassus</i>	Reitter	<i>Mychocerus</i>	from <i>Philothermus</i>
<i>crowsoni</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>curticollis</i>	Sharp	<i>Paracerylon</i>	from <i>Cerylon</i>
<i>curticornis</i>	Dajoz	<i>Philothermus</i>	from <i>Cerylon</i>
<i>curtipes</i>	Sharp	<i>Philothermus</i>	from <i>Cerylon</i>

<i>curtilus</i>	Champion	<i>Mychocerus</i>	from <i>Lytopeplus</i>
<i>curtilus</i>	Grouvelle	<i>Pathelus</i>	from <i>Cerylon</i>
<i>decellei</i>	John	<i>Euxestoxenus</i>	from <i>Elytrotetrantus</i>
<i>depressus</i>	LeConte	<i>Mychocervinus</i>	from <i>Mychocerus</i>
<i>discretus</i>	Casey	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>doyeni</i>	Slipinski	<i>Philothermopsis</i>	from <i>Cerylonopsis</i>
<i>dybasi</i>	Sen Gupta & Crowson	<i>Mychocerus</i>	from <i>LapECAutomus</i>
<i>elephant</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylon</i>
<i>ellipsoideus</i>	Pope	<i>Ellipsorylon</i>	from <i>Cerylon</i>
<i>elongatulus</i>	Slipinski	<i>Philothermopsis</i>	from <i>Cerylonopsis</i>
<i>elongatus</i>	Dajoz	<i>Philothermopsis</i>	from <i>Manengouba</i>
<i>epistomalis</i>	Grouvelle	<i>Afrorylon</i>	from <i>Cerylon</i>
<i>estriatus</i>	Champion	<i>Botrodus</i>	from <i>Murmidius</i>
<i>exaratus</i>	Chevrolat	<i>Philothermus</i>	from <i>Pycnomerus</i>
<i>fallax</i>	Hinton	<i>Orientrylon</i>	from <i>Philothermus</i>
<i>ferrugineus</i>	Hinton & Ancona	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>floridensis</i>	Sen Gupta & Crowson	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>franzi</i>	Dajoz	<i>Philothermus</i>	from <i>Caecodium</i>
<i>gabonensis</i>	Dajoz	<i>Suakokoia</i>	from <i>Ahalaia</i>
<i>gardineri</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>gularis</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>humeralis</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>humilis</i>	Pascoe	<i>Philothermus</i>	from <i>Cerylon</i>
<i>indicus</i>	Motschulsky	<i>Cycloxeenus</i>	from <i>Pocadius</i>
<i>infimus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>insularis</i>	Grouvelle	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>intermedius</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>jamaicensis</i>	Dajoz	<i>Philothermus</i>	from <i>Neoglyptus</i>
<i>javanus</i>	Arrow	<i>Globoeuxestus</i>	from <i>Euxestus</i>
<i>jeanneli</i>	Dajoz	<i>Philothermus</i>	from <i>Cerylon</i>
<i>johni</i>	Heinze	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>kiyuensis</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>laevipennis</i>	Champion	<i>Mychocerus</i>	from <i>Lytopeplus</i>
<i>laevis</i>	Grouvelle	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>lamuginosus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>lawrencei</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>lenticularis</i>	Dajoz	<i>Metacerylon</i>	from <i>Platyxestus</i>
<i>liliputamus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>luzonica</i>	Slipinski	<i>Oroussetia</i>	from <i>Cerylon</i>
<i>madagascariensis</i>	Dajoz	<i>Philothermus</i>	from <i>Pologlyptus</i>
<i>madagascariensis</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>major</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>marginatus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>mexicanus</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>microphthalmus</i>	Dajoz	<i>Philothermus</i>	from <i>Bafutia</i>
<i>microphthalmus</i>	Dajoz	<i>Philothermus</i>	from <i>Kenyalon</i>
<i>minor</i>	Slipinski	<i>Afrorylon</i>	from <i>Philothermopsis</i>

<i>minutum</i>	Carter	<i>Metacerylon</i>	from <i>Acthosus</i>
<i>myrmecophilus</i>	John	<i>Euxestoxenus</i>	from <i>Elytrotetrantus</i>
<i>newtoni</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>nguembae</i>	Dajoz	<i>Philothermus</i>	from <i>Cerylon</i>
<i>nova</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>oaxacanus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>ocellatus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>ocellatus</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>ocellatus</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylon</i>
<i>omercooperi</i>	Hinton	<i>Metacerylon</i>	from <i>Cerylon</i>
<i>orientalis</i>	Sasaji	<i>Mychocerus</i>	from <i>Lapecautomus</i>
<i>papuanus</i>	Slipinski	<i>Metaxestus</i>	from <i>Metacerylon</i>
<i>papuanus</i>	Heinze	<i>Paracerylon</i>	from <i>Cerylon</i>
<i>parallelus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>patens</i>	Grouvelle	<i>Metacerylon</i>	from <i>Cerylon</i>
<i>peckorum</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>perparvulus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>peruvianus</i>	Dajoz	<i>Philothermus</i>	from <i>Comalon</i>
<i>peyrierasi</i>	Dajoz	<i>Pathelus</i>	from <i>Praslinia</i>
<i>peyrierasi</i>	Dajoz	<i>Philothermus</i>	from <i>Madacerylon</i>
<i>peyrierasi</i>	Dajoz	<i>Philothermus</i>	from <i>Pologlyptus</i>
<i>pilifer</i>	Lewis	<i>Mychocerinus</i>	from <i>Mychocerus</i>
<i>pleuralis</i>	Slipinski	<i>Philothermus</i>	from <i>Cerylcautomus</i>
<i>popei</i>	Slipinski	<i>Paracerylon</i>	from <i>Cerylon</i>
<i>praecipuus</i>	John	<i>Euxestoxenus</i>	from <i>Elytrotetrantus</i>
<i>pressulus</i>	Dajoz	<i>Metacerylon</i>	from <i>Cerylon</i>
<i>prosternalis</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>pseudostriatus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>punctulatus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>pygmaeus</i>	Gerstaecker	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>quadricollis</i>	Sharp	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>queenslandicus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>reducens</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>robustus</i>	Arrow	<i>Globoeuxestus</i>	from <i>Euxestus</i>
<i>rubripes</i>	Reitter	<i>Hypodacnella</i>	from <i>Tritomidea</i>
<i>rubroniger</i>	Dajoz	<i>Afrorylon</i>	from <i>Philothermus</i>
<i>rugosus</i>	Slipinski	<i>Gyroleon</i>	from <i>Pseudocerylon</i>
<i>santacatarinae</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>shibatai</i>	Sasaji	<i>Afrorylon</i>	from <i>Philothermus</i>
<i>similis</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>
<i>similis</i>	Pope	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>solidus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>striatus</i>	Sen Gupta & Crowson	<i>Mychocerus</i>	from <i>Lapecautomus</i>
<i>striativentris</i>	Champion	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>striolatus</i>	Grouvelle	<i>Metacerylon</i>	from <i>Cerylon</i>
<i>substriatus</i>	Grouvelle	<i>Afrorylon</i>	from <i>Cerylon</i>
<i>sulcatus</i>	Slipinski	<i>Mychocerus</i>	from <i>Lapethus</i>

<i>sulcimargo</i>	Champion	<i>Mychocerus</i>	from <i>Lytopeplus</i>
<i>sumatrensis</i>	Dajoz	<i>Clavicerylon</i>	from <i>Cerylon</i>
<i>takasago</i>	Sasaji	<i>Afrorylon</i>	from <i>Philothermus</i>
<i>tantillus</i>	Grouvelle	<i>Philothermus</i>	from <i>Cerylon</i>
<i>testaceoruber</i>	Dajoz	<i>Afrorylon</i>	from <i>Philothermus</i>
<i>tibialis</i>	Champion	<i>Mychocerus</i>	from <i>Lytopeplus</i>
<i>torosus</i>	Reitter	<i>Afrorylon</i>	from <i>Cerylon</i>
<i>trifoveolatus</i>	Heinze	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>usambicus</i>	Kolbe	<i>Philothermopsis</i>	from <i>Ditoma</i>
<i>variolosus</i>	Hinton	<i>Ectomicrus</i>	from <i>Philothermus</i>
<i>viettei</i>	Dajoz	<i>Philothermus</i>	from <i>Cerylon</i>
<i>weisei</i>	Grouvelle	<i>Philothermopsis</i>	from <i>Cerylon</i>
<i>yeti</i>	Slipinski	<i>Paracerylon</i>	from <i>Cerylon</i>

B) NEW SPECIES NAMES

<i>Botrodrus championi</i> n. nov.	for <i>Murmidius estriatus</i> Champion, 1913
<i>Mychocerus hintoni</i> n. nov.	for <i>Lapethus ferrugineus</i> Hinton & Ancona, 1934
<i>Philothermus bafut</i> n. nov.	for <i>Bafutia microphtalma</i> Dajoz, 1978
<i>Philothermus diota</i> n. nov.	for <i>Cerylcautomus ocellatus</i> Slipinski, 1982c
<i>Philothermus heinzei</i> n. nov.	for <i>Cautomus cerylonoides</i> Heinze, 1944d
<i>Philothermus malgasz</i> n. nov.	for <i>Pologlyptus madagascariensis</i> Dajoz, 1980
<i>Philothermus misellus</i> n. nov.	for <i>Cerylon marginatum</i> Grouvelle, 1899
<i>Philothermus nominatus</i> n. nov.	for <i>Madacerylon peyrierasi</i> Dajoz, 1980
<i>Philothermus pallipes</i> n. nov.	for <i>Cerylcautomus major</i> Slipinski, 1982c
<i>Suakokoia grouvellei</i> n. nov.	for <i>Cerylon excavatum</i> Grouvelle, 1896

C) NEW GENERA and SPECIES

<i>Afrorylon</i> stat. n.	p. 122 removed from <i>Philothermopsis</i> Heinze
<i>Clavicerylon</i> gen. n.	p. 113 T.S. <i>Cerylon sumatrensis</i> Dajoz, 1975
<i>Ellipsorylon</i> gen. n.	p. 109 T.S. <i>Cerylon ellipsoides</i> Pope, 1962
<i>Globoeuxestus</i> gen. n.	p. 77 T.S. <i>Euxestus globosus</i> Arrow, 1926a
<i>Glomerylon</i> gen. n.	p. 132 T.S. <i>Glomerylon gemma</i> sp. n. (p. 133)
<i>Ivies</i> gen. n.	p. 129 T.S. <i>Ivies costatus</i> sp. n. (p. 130)
<i>Lawrenciella</i> n. nov.	p. 141 for <i>Lawrencella</i> Slipinski nec Strand
<i>Loebliorylon</i> gen. n.	p. 81 T.S. <i>Loebliorylon carinatus</i> sp. n. (p. 82)
<i>Metaxestus</i> gen. n.	p. 78 T.S. <i>Metacerylon papuanus</i> Slipinski, 1982c
<i>Mychocerinus</i> n. nov.	p. 86 for <i>Mychocerus</i> Leconte nec Erichson
<i>Orientrylon</i> gen. n.	p. 121 T.S. <i>Cerylon baloghi</i> Slipinski, 1981a
<i>Pakalukia</i> gen. n.	p. 102 T.S. <i>Pakalukia napo</i> sp. n. (p. 104)
<i>Paracerylon</i> gen. n.	p. 116 T.S. <i>Cerylon biroi</i> Heinze, 1944d
<i>Rostrorylon</i> gen. n.	p. 135 T.S. <i>Rostrorylon vaucheri</i> sp. n. (p. 136)

D) NEW GENERIC SYNONYMS

<i>As</i> Slipinski	new synonym of <i>Pathelus</i> Dajoz
<i>Caecodium</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Cerylautomus</i> Sen Gupta & Crowson	new synonym of <i>Philothermus</i> Aubé
<i>Ceryleuxest</i> Sen Gupta & Crowson	new synonym of <i>Metacerylon</i> Grouvelle
<i>Cerylonopsis</i> Heinze	new synonym of <i>Philothermopsis</i> Heinze
<i>Comalon</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Ebolowaia</i> Dajoz	new synonym of <i>Philothermopsis</i> Heinze
<i>Illerylon</i> Slipinski	new synonym of <i>Pathelus</i> Dajoz
<i>Kenyalon</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Lapethus</i> Casey	new synonym of <i>Mychocerus</i> Erichson
<i>Madacerylon</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Manengouba</i> Dajoz	new synonym of <i>Philothermopsis</i> Heinze
<i>Micruloma</i> Carter	new synonym of <i>Metacerylon</i> Grouvelle
<i>Neoglyptoides</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Neoglyptus</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Pologlyptus</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Praslinia</i> Dajoz	new synonym of <i>Pathelus</i> Dajoz
<i>Praslirylon</i> Nussbaum & Slipinski	new synonym of <i>Pathelus</i> Dajoz
<i>Pseudophilothermus</i> Dajoz	new synonym of <i>Philothermus</i> Aubé
<i>Solumia</i> Dajoz	new synonym of <i>Pathelus</i> Dajoz
<i>Xestoxenus</i> Jelinek	new synonym of <i>Cycloxenus</i> Arrow

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VIII. ABSTRACT

The world genera of Cerylonidae (Coleoptera: Cucujoidea) are revised, including descriptions of twelve new genera (Appendix C). The family currently includes 52 valid genera assigned to 5 subfamilies: Euxestinae, Murmidiinae, Ostomopsinae, Loebliorylinae (new) and Ceryloninae. Most of described species are given generic assignments; several new combinations (Appendix A) and replacement names for junior homonyms (Appendix B) are proposed. Twenty one generic names are put into synonymy (Appendix D). For each genus, to following are given: illustrations of important characters; diagnostic combination; informations about the immature stages; biology; distribution; species included; discussion. The cladistic relationships among the genera of Euxestinae, Murmidiinae and Ceryloninae are discussed. The larval types of Euxestinae, Murmidiinae and Ceryloninae are described and figured. Keys and diagnoses of world subfamilies and genera are given.

Discussion on the constitution of the cerylonid-group of the Cucujoidea, their relationships, and possible classifications are provided. Cerylonidae and Bothrideridae as currently recognized are postulated to be paraphyletic groups. Keys to families of the cerylonid group based on larvae and adults are given.

RIASSUNTO

Viene fatta una revisione a livello mondiale di tutti i generi di Cerylonidae (Coleoptera: Cucujoidea), 12 nuovi generi sono descritti (Appendice C).

Attualmente tale famiglia include 52 generi validi appartenenti a 5 sottofamiglie: Euxestinae, Murmidiinae, Ostomopsinae, Loebliorylinae (nuova) e Ceryloninae.

Sono proposte molte nuove combinazioni (Appendice A) e cambiamenti di nomi per omonimie più recenti (Appendice B); ventuno nomi di generi sono posti in sinonimia (Appendice D).

Di ciascun genere sono forniti i seguenti dati: descrizione dei principali caratteri; combinazione diagnostica, informazioni sugli stadi degli immaturi, biologia, distribuzione, specie incluse, discussione.

Sono fornite relazioni cladistiche tra i generi di Euxestinae, Murmidiinae e Cerylonidae.

Sono descritti e figurati i tipi larvali di Euxestinae, Murmidiinae e Ceryloninae. Sono fornite le chiavi dicotomiche e le diagnosi delle sottofamiglie e dei generi a livello mondiale.

È discussa la formazione del gruppo-cerylonidi dei Cucujoidea, le loro interrelazioni e possibili classificazioni.

Viene postulato che Cerylonidae e Bothrideridae, come è correntemente riconosciuto, sono gruppi parafiletici.

Infine vengono fornite chiavi dicotomiche sulle larve e sugli adulti delle famiglie del gruppo cerylonidi.